



Ain Shams University

Sustainability Report



AINSHAMS UNIVERSITY

SUSTAINABILITY REPORT

Prepared by

AMIRA AYOUB

Architect – Sustainability Consultant –
USGBC LEED & WELL FACULTY – LFA – FITWEL AMBASSADOR

July, 2020




Table of Contents

Introduction	1
The Saffron Palace	1
Green Retrofitting of the Saffron Palace	1
Green Building meaning.....	2
Benefits of Green Retrofitting	2
Keys of Success: Whole Building approach.....	3
Surrounding Site & Landscape	6
Site restoration	6
Heat island reduction	7
Undercover Parking	8
Reflective Materials for hardscape	9
Reflective Roofing Materials	10
Green Roof.....	11
Rainwater Runoff reduction	12
Water efficiency	13
Water Efficient Landscaping	14
Irrigation Efficiency	15
Rain Water and A/C Condensate Harvesting	16
Greywater Treatment and Reuse	17
Water Metering.....	18
Water Saving Devices.....	19
Energy.....	20
HVAC System Efficiency	20
High-Performance Glazing for Windows	21
Interior Lighting efficiency	22
Exterior Lighting efficiency	23
Lighting Controls	24
Roof Insulation	25
Solar Energy.....	26
Photovoltaic Systems for Exterior Lighting	27
Commissioning	28
Materials	29
Construction and Demolition Waste Management.....	29
Waste Management.....	30
Local Materials.....	31
Low VOC Materials	32
Health, Wellbeing and Productivity.....	34
Indoor Air Quality.....	35
Increase the Quantity of Fresh Air.....	35
Tobacco & Smoke Free Environment.....	36
Entryway System.....	37
Thermal comfort.....	38
Daylight.....	39
Acoustics	40
Biophilic Design (Brining Nature to the palace).....	41
Bicycle Facilities	42
COVID-19 Safety strategies (From the WELL Building Standard)	43

Introduction



The Saffron Palace

The Saffron palace was an Egyptian royal palace, now it is inside the main campus of the Ain Shams University. The three-story palace, designed by the French-educated Egyptian architect Moghri bey Saad, It was built during the regime of Isma'il Pasha. It received its name from the saffron plantations which then existed around the palace (Figure 1). The palace held the administration offices of the Egyptian University at the establishment of the university in 1925. The Ministry of Foreign Affairs also lodged important visitors at the palace.

The Anglo-Egyptian treaty of 1936 was signed in the palace and, in March of 1945, the Arab League was founded there.

In 1952, the palace became the administrative headquarters of Ain Shams University, which it remains to the present day.

Green Retrofitting of the Saffron Palace

Green retrofitting of buildings is one of the most significant development activities going on today, and this report aiming to consider all the possible improvements to upgrade energy and environmental performance, reduce water use, and improve the comfort and quality of the space in terms of natural light, air quality, and noise—all done in a way that it is financially beneficial. Moreover considering all the safety protocols and strategies that should be considered to limit the spread of COVID-19. Then, the building and its equipment must be maintained to sustain these improvements over time.

Green Building meaning

We know that buildings are responsible for one-third of the world's greenhouse gas emissions and represent the largest and most cost-effective way to mitigate those emissions. The first wave of high-performing, green building arose as a response to demand for energy and resource efficiency. Times have changed, and strengthened by the advent of green building rating tools, the industry now recognizes that green buildings deliver much more than energy efficiency alone. It also understands that green buildings must be viewed holistically - that energy efficiency cannot come with a price of reduced fresh air and poor indoor environmental quality, or high water consumption. Buildings must be examined in the context of their impact on the local, natural and built environments - and their neighbors. It is only through an integrative process we will realize the full potential of the built environment to deliver an economically, environmentally and socially sustainable future.

The Big Picture

While we have divided this report into sections based on different strategies to follow to create green retrofitting, it is clear that, as the individual pieces fit together to reveal a larger, more complete picture, so too the micro benefits of green retrofitting can be scaled up to generate macro benefits across the entire economy. These 'big picture' benefits - such as climate change mitigation, energy security and resource conservation, improved occupant health, productivity and economic activity, long-term resilience and quality of life - are the priority issues for governments around the world, and are increasingly drivers for both public and private green building programs. The strategies for leveraging green retrofitting for the Saffron Palace, as a way to meet these priorities are explored in this report.

Benefits of Green Retrofitting

Green buildings and Green Retrofitting are a global solution for cities, communities and neighborhoods, and through sustainable design, construction and operations green buildings are reducing carbon emissions, energy and waste; conserving water, reducing operation cost, considering safer materials, and prioritizing people's health and well-being.

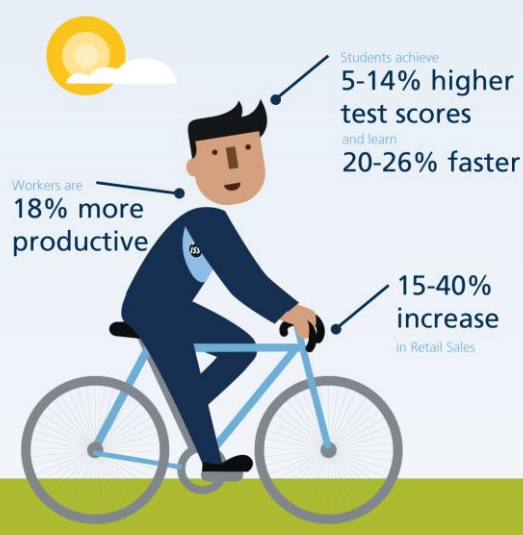
Saffron Palace - Sustainability Report

Linking green retrofitting
to employee productivity

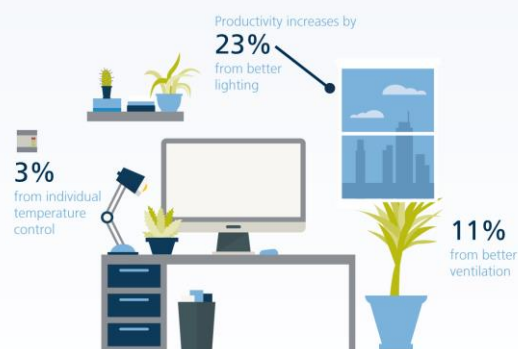
Outside views



Daylight



Systems



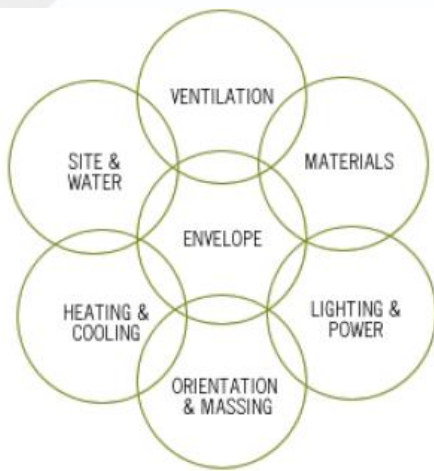
Source: World Green Building Council - The business case for green building

Powered by ISS

Keys of Success: Whole Building approach

Whole Building Planning: From conventional to Integrative Project Delivery

In order to achieve the main goals of the green retrofitting process for the Saffron Palace, A shift from conventional building process to Integrative project delivery process must occur. Project team should follow a whole building planning process, at the traditional planning and design process, building systems were viewed as separate elements - site, structure, systems and use, and design decisions were each based on budget and/or schedule considerations. Changes to a design in order to meet a certain budget or follow an accelerated schedule did not take into account the final performance of the completed building. So the Palace will be considered as a one system model.



In the conventional building process, specialists usually worked in isolation, focusing on their separate area of project expertise and interacting and working together **ONLY** when absolutely needed. *Initial costs and operating costs can actually increase because of this approach.*

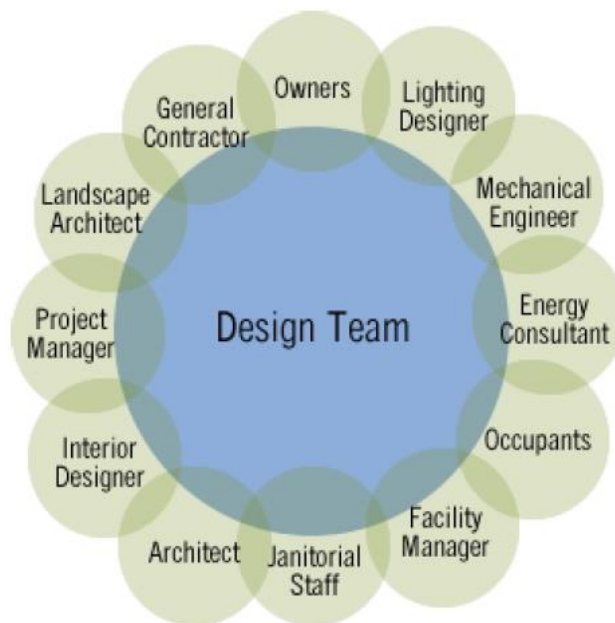
The Integrative Process

An integrative process is an approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, construction, and ongoing operations.

The integrative process requires collaboration among key stakeholders and design professionals from conception to completion. A stakeholder may be the building owner, a major tenant, or an end user customer, like a college student who uses a building for classes. Decision-making processes and complementary design principles should be established early in the planning, satisfying the goals of multiple stakeholders while still achieving the overall objectives of the project. Stakeholder meetings may be hard to schedule or may include stakeholders opposed to new technologies or green strategies, but even if a project encounters stakeholders who resist this new way of planning a project, they can still be beneficial. Project teams can work to alleviate these concerns, which will lead to a happier stakeholder group at the project's delivery.

During the integrative process team members work together and communicate throughout the process of the building's design and construction. Professions that traditionally may not communicate do so, and the process evaluates how design decisions and components will affect (or be affected by) other site decisions and components.

The integrative process results in greater efficiencies, with some estimates showing that single projects employing integrative project teams can achieve savings of 2-10% in the cost of construction.



Conventional building practice usually involves a linear project handoff from architect to engineer to contractor to occupant. By contrast, the integrative process front-loads the process, bringing the client, designers, engineers, contractors, occupants and operators together early in the design process to collaboratively establish project goals, strategize innovative approaches and resolve conflicts in advance. These disciplines then continue to work together in an iterative process toward the project's high performance goals.



The success of a project team depends on:

- Setting specific goals that can be measured and validated.
- Developing strategies that will meet the goals.
- Proper planning.
- Creating processes that foster communication of all team members.
- All team members being on board with the goals and being held accountable for reaching those goals.
- Continuous monitoring of progress throughout the development process and ensuring goals are being achieved.

Surrounding Site & Landscape

The whole building design practice of site planning considers the site including the landscape and hardscape around the site's ability to support the Palace retrofitting while minimizing environmental impacts. The following strategies could be considered for the site consideration

Site restoration



Restoring areas around the project site will benefit both the environment and society. Areas around the palace that previously built upon planting the space with native or adaptive plants can restore the area and ecosystems. Native and adaptive plants are those that are indigenous or native to the area and plants that are adapted to the local environment.

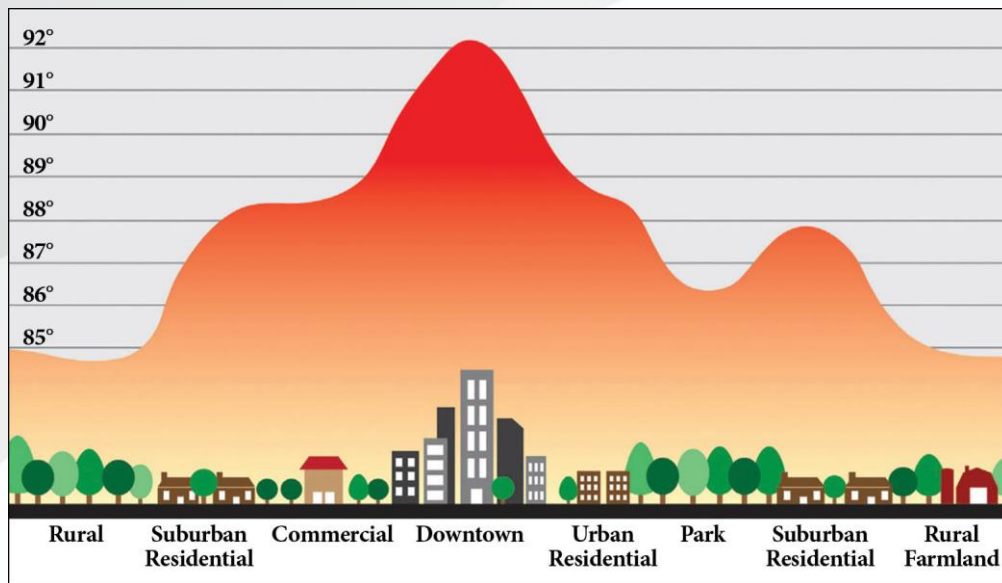
Intent

To conserve existing natural areas around the palace and restore damaged areas to provide habitat and promote biodiversity.

Requirements

An engagement of an Ecologist is recommended to identify the reference habitat of the Palace location, and plan for the restoration and enhancement of the ecological performance of the site around the palace. On-site landscape must be designed to mature and evolve, and to emulate the functionality of the Reference Habitat. Saffron plantation should also be studied.

Heat island reduction



Heat islands are temperature differences between developed and undeveloped areas. An urban heat island effect is caused by sunlight heating up dark colored surfaces such as roads and rooftops. Huge quantities of heat are generated in buildings that have dark rooftops and absorb heat rather than reflect it. Outside, an example of that is how much hotter a blacktop parking lot is than a grassy field.

Strategies to reducing heat islands:

- Undercover parking
- Reflective materials of hardscape
- Reflective roofing materials
- Installing green roofs.

Undercover Parking



Dark reflective surfaces used for parking radiates heat which leads to the creation of the heat island effect. The conversion from asphalt-covered parking to shaded and/or underground parking leads to a considerable mitigation of the urban heat island effect.

Intent

Mitigate the urban heat island effect around the parking

Requirements

Install shades for the parking area within the site limit of the palace.

Reflective Materials for hardscape



Existing site hardscapes including roads, parking areas and sidewalks are covered with conventional pavement, mostly black asphalt. These surfaces reach high surface temperatures when not shaded by trees, buildings or other surrounding structures; which leads to the creation of the heat island effect, especially during summer in hot climates. Associated adverse impacts include: reduced human thermal comfort and health, elevated cooling energy demand for buildings, and reduced air quality (ground level ozone).

Intent

Reduce the heat island effect by using outdoor paving tiles with a solar reflectivity between 35-45%

Requirements

Use outdoor paving tiles such as: white cement tiles (loose laid), white terrazzo tiles, light colored gravel. This attains a solar reflectivity between **35-45%** (this value should not be exceeded for outdoor paving to control glare).

Reflective Roofing Materials



Solar reflectance is the most important feature of the thermal performance of a roof. It is a measure of how much solar radiation is reflected by the surface, on a scale of 0 to 1; the larger the value the higher the solar reflectance, and the cooler the roof surface.

Intent

Reduce the solar gain of buildings by reducing heat transfer from the roof to lessen the environmental and economic problems resulting from increased energy loads.

Requirements

Paint the roof with white coating with solar reflectivity higher than or equal to 80- 85% of the roof area. Provide product data sheets indicating solar reflectivity percentage, physical properties and additional technical information.

Green Roof



A vegetated roof can combat the heat island effect, help provide insulation to reduce energy costs.

Intent

Reduce the solar gain of buildings by reducing heat transfer from the roofs to lessen the environmental and economic problems resulting from increased energy loads, and mitigate urban heat islands.

Requirements

Install a hydroponic system on the roof. (In case the roof won't be used for PV panels)

Rainwater Runoff reduction



In Egypt, runoff and sewage are combined into one drainage system where the entire quantity must be treated. A heavy rainfall can cause the system to overflow, resulting in sewage backing up and overflowing, at the same time sedimentation occurs (pollutants from the site will enter the water stream).

Intent

Reduce the impervious surface around the palace site (asphalt) to allow the water be naturally filtrated.

Requirements

Install Open grid pavement around the palace site, it is a material that has open cells to allow vegetation to grow through it. This pavement has the added benefit of allowing rainwater to percolate through the open cells. (This point should be coordinated with the site restoration strategy requirements)

Water efficiency



Seventy percent of the Earth's surface is covered by water, but less than 1% of that water is fresh water. Only 1% of that 1% is accessible for human use.¹ According to the United Nations Environment Program, if our present patterns continue, we will live in water scarcity by the year 2025.

Water Efficient Landscaping



Local native plants are well-adapted to the climate, light, soil, and environmental conditions within a particular area without direct or indirect human interference, and therefore offer the most sustainable habitat. Native plants preserve or improve soil fertility, reduce soil erosion, have lower watering requirements, require less fertilizers and pesticides since they can grow using nutrients present within the local soil. Grass and turf species consume large quantities of outdoor water, therefore reducing the vast expanse of grass landscaping would significantly reduce the water consumption for irrigation, as well as benefit the environment, and save both time and money. Conversely, aloe Vera and specific groundcovers are low-water consuming plants which have very low watering requirements. In addition, native plants are more equipped to resist pest invasions, and provide a suitable food source, shelter and nesting sites for local wildlife. On a wider ecological scale, native plants contribute to the formation of healthy ecosystems, and due to its' inherent low maintenance nature, it reduces the amount of volatile organic chemicals and toxic particulate matter emitted by landscape maintenance equipment

Intent

Reduce water used for irrigation by reducing the area covered by grass, and utilizing native plants in landscaping.

Requirements

Use native plants which are adapted to local conditions; this provides the combined benefits of reduced water needs and maintenance requirements. And involve an ecologist and a landscape to conduct site analysis and make the plant selection, consideration of Saffron plantation at the site should be considered.

Irrigation Efficiency



The increased demand for water use in several outdoor applications places additional strain on the existing limited resources. Accordingly, the efficiency of water irrigation practices would lead to reduced environmental burdens and substantial water savings as the demand for water is lowered, and maintenance and operation costs are reduced. It is estimated that the improper design, installation and maintenance of irrigation systems results in the loss of 50% of water through evaporation, wind, or runoff.

Intent

Reduce or eliminate the use of potable water for landscape irrigation practices, and improve the irrigation efficiency system

Requirements

Reduce potable water consumption using drip irrigation system for all the surrounding landscaping around the palace.

Rain Water and A/C Condensate Harvesting



Rainwater harvesting is an effective and economical technique, which encompasses the collection of run-off rainwater from rooftop or ground surfaces landscape irrigation, environmental management and other uses.

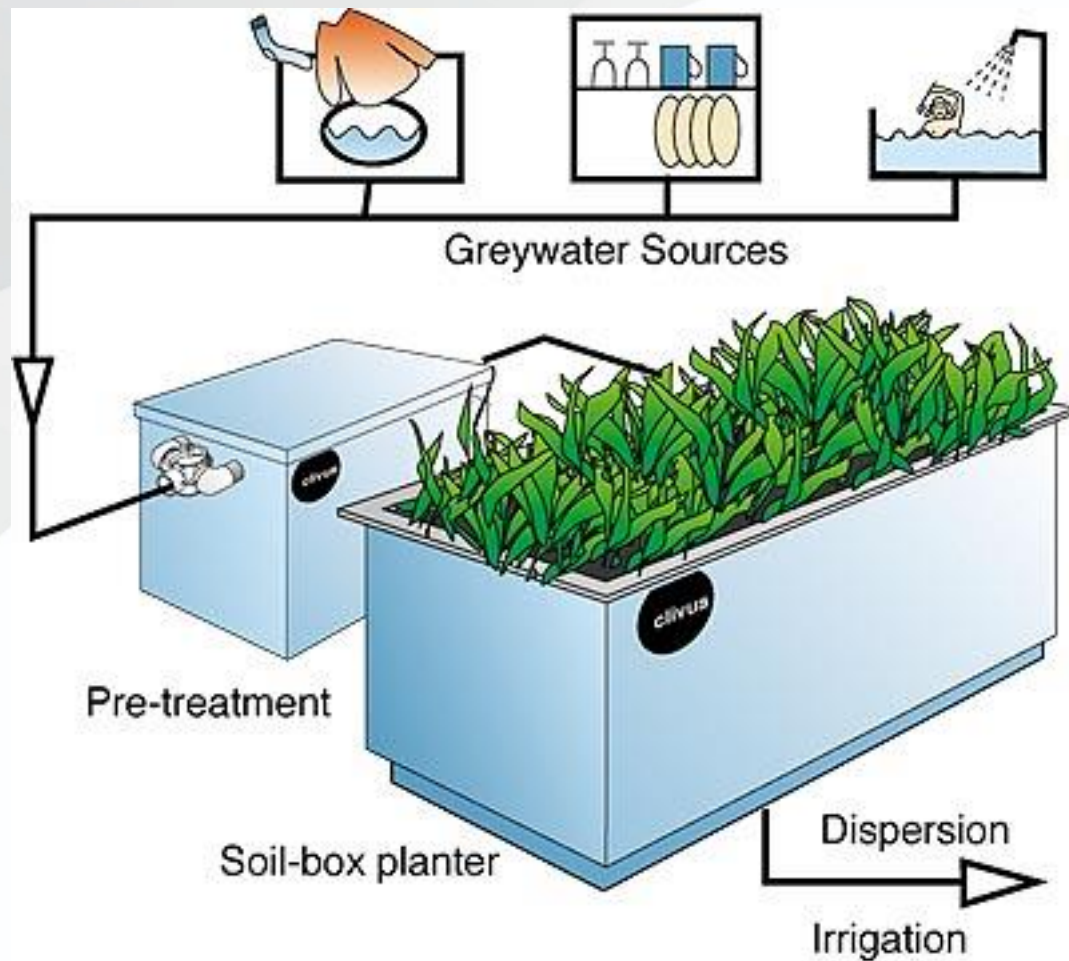
Intent

Reduce potable water usage and reduce the burden on the municipal sewage treatment system by harvesting and reusing rainwater and/or AC condensate.

Requirements

Install appropriate rainwater harvesting and AC condensate collection and reuse system, to be used in WC flushing instead of potable water.

Greywater Treatment and Reuse



Greywater is described as wastewater from showers, hand basins, washing and kitchen sinks, that has not come into contact with fecal contamination. Currently, economically feasible uses of treated greywater include toilet flushing, cleaning outdoor spaces,; where potable water quality is not required

Intent

Reduce potable water consumption and reduce the load on the municipal sewage system by collecting and reusing treated wastewater for non-irrigation purposes.

Requirements

- Install on-site greywater recycling system to collect and treat 100% of grey water generated within the building, and reuse the treated water in toilet flushing or irrigation.
- Confirm that the treated grey water conforms to required standards of quality.

Water Metering



The proper management and reduction in a facility's water usage is based on monitoring and recording its water use, and educating the building users about the importance of water management planning. Water meters work by continuously monitoring the water flowing through pipes to calculate the volume of water flow. Accordingly, they allow the facility to constantly track the existing water consumption, and detect sources of excessive water use. In addition, they recognize otherwise undetected water leaks, and identify efficient water saving opportunities.

Intent

Reduce potable water usage by supporting the water management in the facility through the use of water meters and identifying water saving opportunities. Provide continuous tracking to support water efficiency, and reduce potable water costs and associated adverse environmental impacts.

Requirements

Install permanent water meters for irrigation, indoor and other process water.

Water Saving Devices



There is increasing recognition in the water industry of the need to conserve water, including reducing the water consumption of fixtures and appliances, in order to protect the environment, and reduce water costs. Efficient lavatory faucets that use a maximum of 6 LPM can reduce a sink's water flow up to 30% or more than standard faucets without negatively affecting the performance. Accordingly installing efficient lavatory faucets and faucet accessories saves a large amount of water and energy nationwide each year. Lavatory faucets use 20% of the indoor water consumption of commercial buildings. Similarly, efficient water closets, whether single- or dual-flush, use less than 6 LPF, which offers more savings to water. Water closet flush tanks use 25% of the indoor water consumption of the commercial buildings.

Intent

Reduce the water and associated energy consumption of water fixtures and appliances, and ensure efficient water use and high level of user satisfaction.

Requirements

Replace existing fixtures and appliances with water-efficient ones

Water Saving Devices
Install WC flush Tank with low rate < 6 LPF or Dual Flush WCs with full and half flush flow
Install Urinals with flush tank flow rate < 0.4 LPF
Install lavatory faucet (sink) with flow rate < 8 LPM

Energy

Increased energy use and the burning of fossil fuels are linked to global warming and air pollution. It's easier to save energy by reducing the demand and the loads needed than to buy expensive high-efficiency equipment. In this section we will explore strategies to reduce the energy use of the Saffron Palace, use renewable energy sources, and reduce greenhouse gas emissions.

HVAC System Efficiency



The building sector being the largest consumer of electrical energy, accounts for approximately a third of final energy consumption globally. The energy efficient design and operation of HVAC systems demonstrates a major potential source of reduction in energy consumption, and CO₂ emissions, as they are based on the consumption of fossil fuels used in the carbon-intensive electricity systems.

Intent

Reduce energy consumption in the building by installing efficient HVAC system which in turn reduces the environmental and economic harms of excessive energy use.

Requirements

Install energy efficient HVAC system that follows or exceeds the requirements in the mandatory path of ASHRAE 90.1-2007.

High-Performance Glazing for Windows



High-performance windows and glazing systems are fundamental elements to reducing the transmission of heat to the interior of the building by reducing heat conduction and solar heat gain.

Intent

Increase the energy efficiency of buildings using high performance glazing that reduces the heat transfer through the building's openings by reflecting thermal energy, and providing a comfortable thermal environment that improves the occupant's performance, health and well-being.

Requirements

Install high-performance glazing with U-Value less than or equal to 2 W/m²K and SHGC less than 0.7, for all windows with width 800mm or larger (Attached a proposal for window glazing with the required specifications)

Interior Lighting efficiency



Lighting is often the largest contributor to a building's energy use, so lighting design and control are critical to reducing energy consumption. Energy is used both to power the lights and provide additional cooling to compensate for the added heat generated by lights. The light-emitting diode (LED) is one of the most energy-efficient lighting technologies. LED light bulbs are more durable, last longer, emit less heat, and offer higher lighting quality than other light sources, which reduces the cooling loads and enhances the indoor thermal comfort. Although LEDs have a higher initial cost, they lead to significant long term cost savings.

Intent

Achieve higher energy efficiency with the use of efficient lighting technologies, and enhance the health, wellbeing and performance of building users.

Requirements

Install LED (Light Emitting Diode) light bulbs in all interior spaces.

Exterior Lighting efficiency



The use of LED outdoor lighting fixtures will result in a considerable amount of energy saving since they are left to operate for extended periods of time. LEDs are also safe and contain no harmful contaminants, therefore they eliminate the risk of exposure to Polychlorinated Biphenyls (PCBs), which are present in fluorescent ballasts, and are carcinogenic with detrimental impacts on the immune, nervous and endocrine systems.

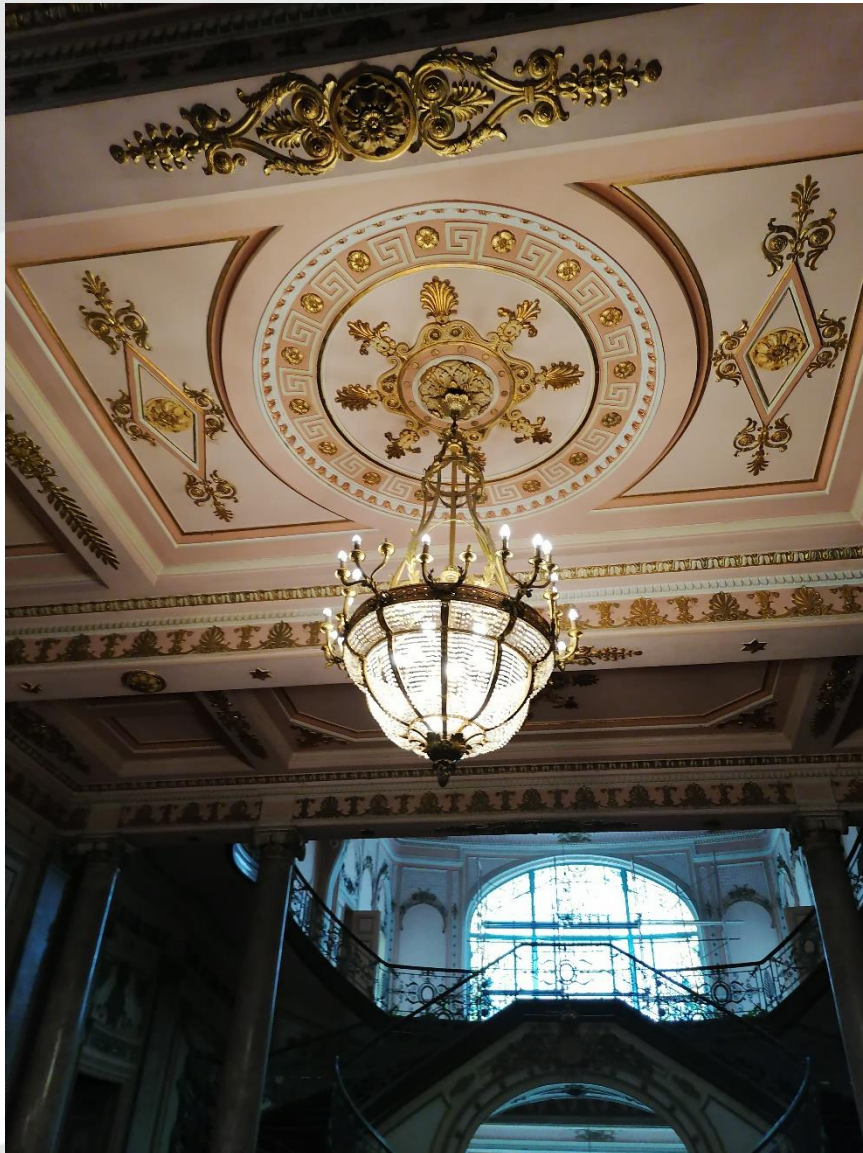
Intent

Achieve higher energy efficiency with the use of efficient lighting technologies.

Requirements

Install LED lighting fixtures in all public areas such as roads, public squares, parks, and outdoor social spaces.

Lighting Controls



Automatic light shut offs can ensure that lights are not left on after work hours or when they are not needed. This will not only reduce light pollution but also save energy on a project, also installing a manual override to the shut off system for employees who may be working late.

Intent

Reduce the total energy consumption resulting from lighting use, and improve the comfort of indoor spaces.

Requirements

Install sensors to automatically turn off unnecessary lights, dimmed or altered in some way in several spaces including: corridors, staircases, parking, bathrooms, conference rooms, closed cabins and open offices.

Roof Insulation



Waterproofing and thermal insulation are fundamental characteristics of an effective roofing insulation system. Waterproofing membranes serve the essential function of preventing water penetration inside the building which affects the overall structure of the building. Humidity and moisture are two properties which cause great damage to the building, including mold growth, wall cracking, and peeling of paint work.

Intent

Reduce the solar gain of buildings by reducing heat transfer from the roof to lessen the environmental and economic problems resulting from increased energy loads, and mitigate urban heat islands by improving indoor air quality and thermal comfort. Protect the building structure from water damage caused by rain, moisture and leaks.

Requirements

Install roof waterproofing and thermal insulating membranes. Different types of locally manufactured waterproofing membranes include elastomeric liquid membranes and modified bituminous membranes. Install thermal insulating roof membranes with U-values not less than $0.273 \text{ W/m}^2\text{K}$ occupying the entire roof area. Most commonly used thermal insulating membranes include polystyrene and/or polyurethane. The properties of some membranes offer both waterproofing insulation in addition to thermal resistance. Provide technical specification documents for all installed roof membranes.

Solar Energy



Solar power is a clean and renewable way to generate electricity by harnessing the power of the sun. Solar technologies are broadly characterized as either passive or active, depending on the way they capture, convert and distribute sunlight. Active solar techniques include the use of photovoltaic panels or solar thermal collectors (with electrical or mechanical equipment) to convert sunlight into useful outputs. Passive solar techniques include orienting a building to the sun and selecting materials with favorable thermal mass or light dispersing properties.

Intent

Reduction of the environmental and economic impacts associated with the use of the limited fossil fuel energy resources.

Requirements

Install on-site solar energy to offset the annual electrical consumption of energy systems.

(Attached a proposal for saving more than 70% of energy consumption by cost)

Photovoltaic Systems for Exterior Lighting



Photovoltaic lighting is a stand-alone, practical and cost-effective system that is not dependent on the utility grid network. The lighting system stores solar energy in batteries using PV panels, for its subsequent release at night to power light sources. Exterior lighting powered by photovoltaic lighting requires less maintenance than regular exterior lighting, and they have a lower risk of overheating, since they do not have external wires, which reduces the occurrence of accidents.

Intent

Reduce the operational costs for exterior lighting by using photovoltaic systems that are not dependent on the utility grid network through the provision of on-site solar photovoltaic systems to provide exterior lighting.

Requirements

Install photovoltaic system to serve all exterior lighting fixtures for the entire building.

Commissioning



Intent

Verify that the project's energy-related systems are fixed and calibrated to perform according to the project goals requirements, basis of design and construction documents in the areas of energy, water, and indoor environmental quality. Ensure that the building's staff are adequately trained to run and maintain the building's systems and equipment, in order to evade the adverse impacts associated with the malfunctioning of the building's energy systems and assemblies.

Requirements

Develop and implement a commissioning plan for energy-related systems, including mechanical, electrical, fire and life safety, integrated systems, specialty systems and the building envelope. Designers are required to document all commissioning, testing, adjusting, and balancing activities in a technical specification document. Correspondingly, contractors are required to execute all the commissioning, testing, adjusting, and balancing activities dictated in the technical specification document for all energy systems.

Document all commissioning, testing, adjusting, and balancing activities for all energy systems during the construction phase, as follows:

- Documents showing tests to verify installation, adjusting, balancing and performance.
- Troubleshooting and their corrective actions.
- Initial Peak load energy readings and compare them with design estimated values.
- Complete System manuals that must include As-built drawings, and operation and maintenance manual.
- Training reports.
- Document showing all archived spare parts.
- Operation and Maintenance Plan.
- Any other requirements dictated in specifications document.

Materials

Construction and Demolition Waste Management



The production of massive amounts of building materials waste from construction and demolition waste activities are the main obstacles for achieving sustainable construction objectives.

Intent

To reduce the waste that is generated by building occupants and hauled to and disposed of in landfills.

Requirements

Develop and implement a construction and demolition waste management plan:

- Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.
- Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the materials will be taken and how the recycling facility will process the material.

Provide a final report detailing all major waste streams generated, including disposal and diversion rates.

Waste Management



The correct segregation of municipal solid waste at source allows commercial building users to function as educated active stakeholders in the waste management process. Proper municipal waste management is critical for human safety and the environment. When trash is disposed of properly, this decreases the level of airborne pollution, and improves the public health. The use of proper trash liners and containers, prevent toxic materials from entering the environment.

Intent

Sort domestic waste at the source, in order to be sent to recycling facilities, therefore cut the quantity of waste going to landfills.

Requirements

Conduct a waste audit, involving employees in the collection, sorting, and weighing of trash. Municipal solid waste should be sorted into either 2 or 3 streams, where wet wastes are used as composts and the recyclables are sent to recycling facilities. Three segregation streams (dry recyclables - dry non-recyclables - wet/compost) the wet waste is the organic waste which will be composted. Dry recyclables include plastics, papers, glass, etc., and dry non-recyclables include composite materials and packaging material.

Local Materials



Locally-sourced building materials support the local economy and reduce transportation costs, harmful emissions and energy consumption.

Intent

Use regionally extracted and manufactured building materials and products, thereby supporting the use of local resources and reducing the environmental impacts resulting from long travel distances.

Requirements

- Use building materials that have been extracted, harvested or recovered, as well as manufactured in Egypt.

Low VOC Materials



VOCs (Volatile Organic Compounds) are found in various indoor products, such as paints, aerosol sprays, wood preservatives, cleansers, air fresheners, furnishings and pesticides. High concentrations of ozone near ground level, can cause eye, nose and throat irritation. Further health effects include headaches, nausea, coordination imbalance, liver, kidney, and central nervous system damage.

Intent

Reduce the quantity of indoor air contaminants in the form of VOCs (volatile organic compounds) that are hazardous to air quality, and harmful to the comfort, productivity and health of installers and building users.

Requirements

Ensure all paints and coatings comply with the following limits for VOC content, and provide supporting documents for each product.

- | | |
|--|--|
| ▪ Flat paints and coatings: 50g/L | ▪ Pretreatment wash primers: 420g/L |
| ▪ Non-flat paints and coatings: 150g/L. | ▪ Clear wood finishes, varnishes: 350g/L |
| ▪ Dry-fog coatings: 400g/L | ▪ Clear wood finishes, lacquers: 550g/L |
| ▪ Primers, sealers, and undercoats: 200g/L | ▪ Floor coatings: 100g/L |
| ▪ Anticorrosive and antirust paints applied to ferrous metals: 250 g/L | ▪ Shellacs, clear: 730 g/L |
| ▪ Zinc-rich industrial maintenance primers: 340g/L | ▪ Shellacs, pigmented: 550g/L |
| | ▪ Stains: 250g/L |

Ensure all adhesives and sealants comply with the following limits for VOC content, and provide supporting documents for each product .

- Concrete curing compound: 60 g/L
- Concrete sealer: 10 g/L
- Concrete form release agents: 0g/L
- Garage deck sealer: 50g/L
- Wood glues: 20 g/L
- Millwork and casework adhesives: 20g/L
- Metal to metal adhesives: 30 g/L
- Adhesives for porous materials (except wood): 50 g/L
- Subfloor adhesives: 50 g/L
- Plastic foam adhesives: 50 g/L
- Carpet adhesives: 50 g/L
- Carpet pad adhesives: 50 g/L
- Carpet seam sealer: 50g/L
- VCT and sheet vinyl adhesives: 50 g/L
- Cove base adhesives: 50 g/L
- Rubber floor adhesives: 60 g/L
- Wood flooring adhesives: 100 g/L
- Ceramic tile adhesives: 65 g/L
- Gypsum board and panel adhesives: 50 g/L
- Gypsum drywall joint compound: 20 g/L
- Portland cement plaster: 20 g/L
- Multipurpose construction adhesives: 70 g/L
- Cast resin countertop silicone sealant: 20g/L
- Plastic laminate adhesives: 20 g/L
- General contact adhesive: 80 g/L
- Structural glazing adhesives and compounds: 100 g/L
- Silicone sealant: 50 g/L
- Pipe thread sealant: 50 g/L
- Duct sealant: 10 g/L
- Plastic cement welding compounds: 250 g/L
- ABS welding Compounds: 400 g/L
- CPVC welding Compounds: 270 g/L

Health, Wellbeing and Productivity

Buildings have a direct impact on our health and wellbeing and direct line can be drawn between how and where a person spends their time, the quality, amenities, and design of that environment, and individual health outcomes. Spaces that filter and promote clean air, provide ample opportunities for drinking water, encourage moderate physical activity, situate users to views of nature and daylight, and foster a culture of healthy habits, are spaces that can deeply alter a person's health trajectory. And it was also found that employees prefer green buildings that make them feel healthier and more productive, in this section we will explore strategies for improving the Saffron place indoor environmental qualities.

EIGHT FEATURES THAT MAKE HEALTHIER AND GREENER OFFICES

1. INDOOR AIR QUALITY & VENTILATION

Healthy offices have low concentrations of CO₂, VOCs and other pollutants, as well as high ventilation rates.



101%

WHY?
increase in cognitive scores for workers in a green, well-ventilated office.¹

2. THERMAL COMFORT

Healthy offices have a comfortable temperature range which staff can control.



6%

WHY?
fall in staff performance when offices are too hot and 4% if too cold.²

3. DAYLIGHTING & LIGHTING

Healthy offices have generous access to daylight and self-controlled electrical lighting.



WHY?
46 minutes

more sleep for workers in offices near windows.³

4. NOISE & ACOUSTICS

Healthy offices use materials that reduce noise and provide quiet spaces to work.



66%

WHY?
fall in staff performance as a result of distracting noise.⁴

5. INTERIOR LAYOUT & ACTIVE DESIGN

Healthy offices have a diverse array of workspaces, with ample meeting rooms, quiet zones, and stand-sit desks, promoting active movement within offices.



WHY?
Flexible workspaces help staff feel more in control of their workload and engenders loyalty.⁵

6. BIOPHILIA & VIEWS

Healthy offices have a wide variety of plant species inside and out as well as views of nature from workspaces.



7-12%

WHY?
improvement in processing time at one call centre when staff had a view of nature.⁶

7. LOOK & FEEL

Healthy offices have colours, textures, and materials that are welcoming, calming and evoke nature.



WHY?
Visual appeal is a major factor in workplace satisfaction.⁷

8. LOCATION & ACCESS TO AMENITIES

Healthy offices have access to public transport, safe bike routes, parking, and showers, and a range of health food choices.



€27m

WHY?
savings through cutting absenteeism as a result of Dutch cycle-to-work scheme.⁸

EMPLOYEE ENGAGEMENT



Healthy offices have employees that are regularly consulted and that feedback is used to drive continuous improvement.⁹

Indoor Air Quality



The health and productivity benefits of good indoor air quality (IAQ) are well established. This can be indicated by low concentrations of CO₂ and pollutants, and high ventilation rates. A comprehensive body of research can be drawn on to suggest that productivity levels is directly affected by the quality of the indoor air. Fresh air or air quality is one important part of indoor air quality. Good indoor air quality comes from mechanical or naturally ventilated systems that function appropriately. By increasing the quantity of fresh air entering a building, the ratio of poor air is reduced. Current code minimums do not supply enough fresh air and are not good enough for occupant well-being, and now it is very important after COVID-19

Increase the Quantity of Fresh Air



Intent

Increase the quantity of fresh air for occupant health and wellbeing

Requirements

- Comply with the current version of ASHRAE 62, or international equivalent.
- Provide direct exhaust for kitchens, bathrooms, and janitorial areas.

Note: it is important to install an air quality sensor to examine CO₂, VOC, and Particulate Matter (PM) concentrations and see if pollutant levels were above recommended ranges.

Tobacco & Smoke Free Environment



Exposure to secondhand smoke can cause lung cancer in nonsmokers and results in approximately 3,000 lung cancer deaths per year in nonsmokers. Secondhand smoke also can increase the risk of heart disease.

Intent

Minimize or eliminate the exposure of building users, indoor surfaces, and ventilation air distribution systems to cigarette smoke.

Requirements

- Prohibit smoking inside the palace.
- Prohibit smoking within 8 meters of building entrances, outdoor air intakes and operable windows.

Entryway System



Entryways capture dirt and dust from entering the building leading to better indoor air quality. , contributing to improved indoor air quality and enhanced respiratory and mental health.

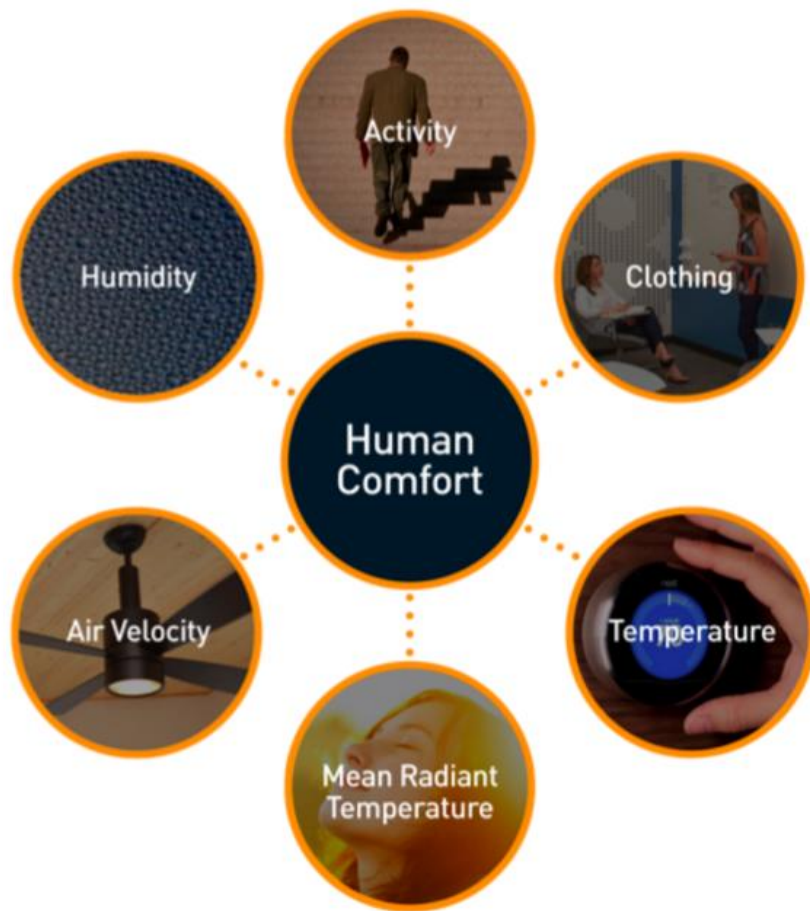
Intent

Entryway systems reduce the amount of dirt and particulates that enter the building, contributing to improved indoor air quality and enhanced respiratory and mental health.

Requirements

Install entryway systems 1m long in the direction of travel at all outdoor accesses, It should be cleaned and maintained weekly, if mats are provided.

Thermal comfort



This is very closely related to IAQ, and indeed separating out the benefits is difficult. However, the relationship is clear, with research demonstrating that thermal comfort has a significant impact on workplace satisfaction. Suggesting a general rule about the size of productivity gains is not a robust exercise because of the importance of specific circumstances and the lack of comparability between studies. However, studies consistently show that even modest degrees of personal control over thermal comfort can return single digit improvements in productivity. That's why it is very important to install thermal control devices for the employees working at the palace.

Intent

Access to thermal control devices improves overall indoor comfort, which fosters positive mental health outcomes.

Requirements

Provide occupants access to thermal control devices that allow for individual or group control of the temperature of their space, the thermal control devices or systems should include the following:

- thermostat controls
- HVAC grills that allow for vent control
- Building Management system that allow for temperature control requests
- stand-alone fans

Daylight



Good lighting is crucial for occupant satisfaction. Several studies in the last decade have estimated productivity gains as a result of proximity to windows, nature.

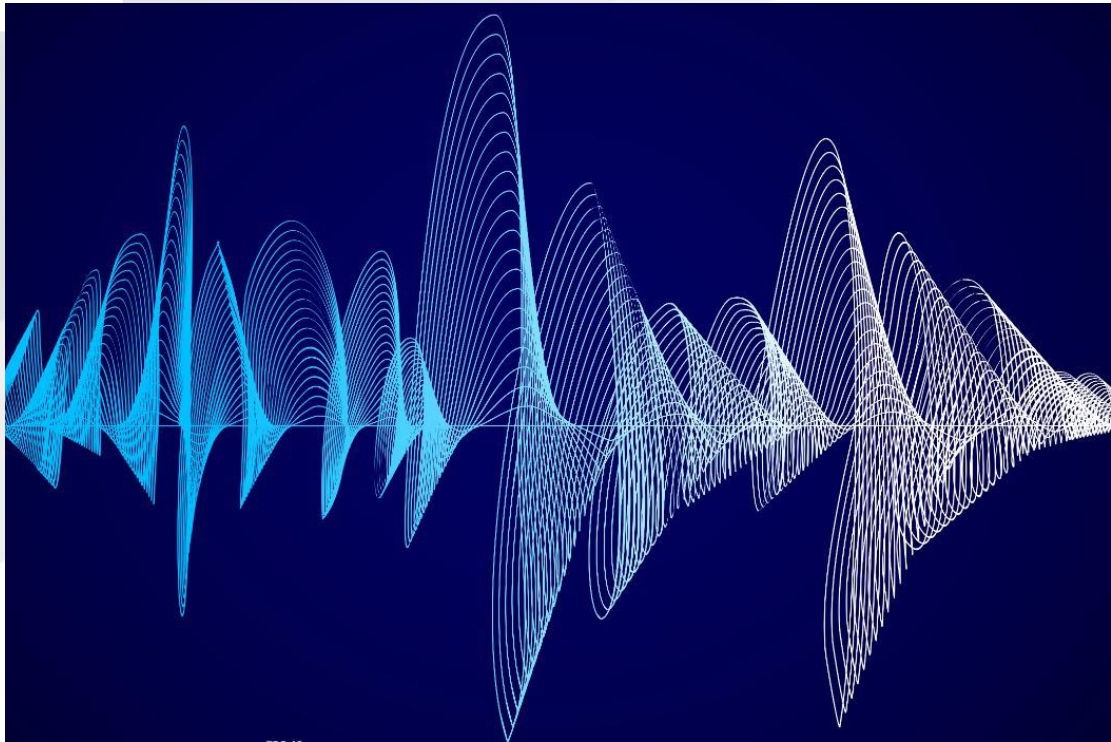
Intent

Allow the palace regular occupants the access to natural daylight to reduce stress and improve mental health.

Requirements

Projects must include access to natural daylight for a minimum of 51% of all of the palace regular employees.

Acoustics



Being productive in the modern knowledge-based office is practically impossible when noise provides an unwanted distraction. This can be a major cause of dissatisfaction amongst occupants.

Intent

Creating a quality acoustical design, which provides many benefits to occupants including increased comfort and productivity.

Requirements

Hire an acoustic engineer to create a plan for the interior spaces where the employees work, the plan should consider the following

- Creating soft surfaces by using sound absorbing materials made from recycled products
- Using white noise to mask other sounds
- For the HVAC system avoid the use of small diameter ducts with high velocity airflow, as these ducts tend to be noisier
- Enclosing or separating spaces where privacy and concentration is important

Biophilic Design (Brining Nature to the palace)



The rise of Biophilia, the suggestion that we have an instinctive bond to nature, is a growing theme in the research. A growing scientific understanding of biophilic design, and the positive impact of green space and nature on (particularly) mental health, has implications for those involved in office design and fit-out, developers and urban planners alike.

Intent

Increase oxygen levels and subsequently improve concentration levels and decrease mental fatigue.

Requirements

Include plantlife inside the palace and at the employee workplace.

Bicycle Facilities



Bicycle facilities are created by the allocation of part of the road to cyclists and providing secure shaded bicycle rack. The manner in which the road network is designed, constructed and managed has a substantial impact on the efficacy and safety of cycling. The provision of suitable conditions for non-motorized transport or active transport relieves traffic congestion, reduces local air pollution, improves traffic safety, and increases physical activity, among other benefits.

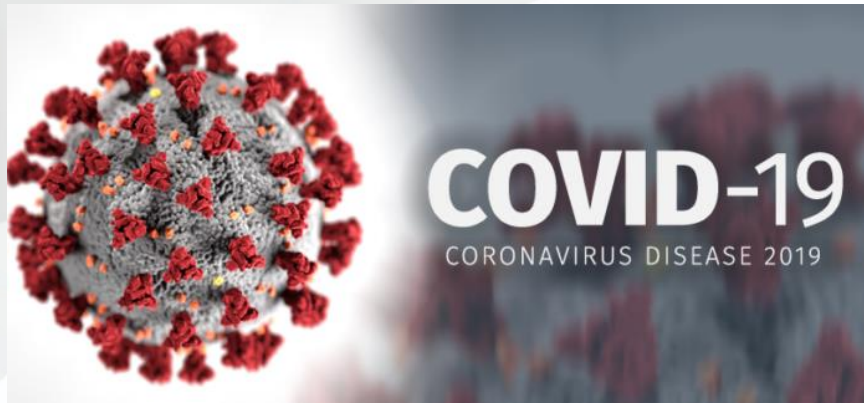
Intent

Promote a safe and comfortable cycling experience by providing well-designed shaded bicycles racks. Decrease motorized vehicle use to conserve natural resources and reduce atmospheric pollution, while improving the user's health, social networking and quality of life.

Requirements

Provide secure shaded bicycle racks to decrease automobile use to lessen fuel consumption & emissions, promoting physical activity and public health, the rack should be located within 30m from the main palace entrance.

COVID-19 Safety strategies (From the WELL Building Standard)



The WELL Building Standard (WELL), was created to help people thrive in the buildings where we spend our lives. With its research backing and global focus, WELL has evidence-based strategies within it, it provide an actionable framework for organizations and communities responding to COVID-19 and preparing for a safer and healthier future. To that end, we grouped select, applicable strategies from the WELL Building Standard v2 pilot (WELL v2) around key themes that reflect how the Saffron Palace can approach prevention and preparedness, resilience and recovery in relation to COVID-19 and other respiratory infections, from enhancing air quality to supporting mental health.

1- Handwashing

Reduce pathogen transmission associated with washing and drying hands by providing sufficiently large sinks, disposable soap containers and hand-drying towels.



2- Water Quality

Provide drinking water that meets performance thresholds for dissolved metals, organic pollutants and disinfectants. Filter drinking water and perform quarterly water quality tests.



3- Smoke-free Environment

Deter smoking, minimize occupant exposure to secondhand smoke and reduce smoke pollution.

SMOKE FREE



4- Family Support

Enable working parents and caregivers to care for members of their family. International WELL.



5- Occupant Survey

Collect and respond to in-depth feedback from building users on their comfort, satisfaction, behavior, health and other robust factors related to their well-being, both before and during occupancy.



6- Circadian Lighting Design

Provide appropriate exposure to light for maintaining circadian health and aligning the circadian rhythm with the day-night cycle.



7- Stress Support

Identify and mitigate sources of workplace stress and provide programs that support stress management.



8- Restorative Opportunities

Create opportunities for mental recovery and restoration by providing micro- and macro-breaks from the workplace.



9- Access to Nature

Incorporate nature into the design of interior and exterior spaces by integrating plants, water, light and views, as well as natural materials, patterns, colors or images.





Certifying The **Saffron Palace**

Certifying the Saffron Palace

A green building rating system is a tool that evaluates the performance of a building and its impact on the environment. It comprises a predefined set of criteria relating to the design, construction, and operations of green buildings.

The International Living Future Institute is an environmental NGO committed to catalyzing the transformation toward communities that are socially just, culturally rich and ecologically restorative.



LIVING CERTIFICATION



PETAL CERTIFICATION



Responding to climate change with holistic high performance.

Required Imperatives:

C1	01	Ecology of Place
C2	04	Human Scaled Living
C3	05	Responsible Water Use
C4	07	Energy + Carbon Reduction
C5	09	Healthy Interior Environment
C6	12	Responsible Materials
C7	17	Universal Access
C8	18	Inclusion
C9	19	Beauty + Biophilia
C10	20	Education + Inspiration



World class efficiency and characteristics, reinforcing a fossil fuel free future.

- 100% building energy load offset with on-site renewables, driving efficiency
- Pathway for premium off-site renewables for certain project types



Carbon neutral with top tier efficiency.

- 100% building energy load offset with on- or off-site renewables
- For existing buildings, combustion allowed
- Embodied carbon reduction and offset

Summit of holistic aspiration and attainment; fully restorative.

All Imperatives must be achieved to certify:

01	Ecology of Place
02	Urban Agriculture
03	Habitat Exchange
04	Human Scaled Living
05	Responsible Water Use
06	Net Positive Water
07	Energy + Carbon Reduction
08	Net Positive Carbon
09	Healthy Interior Environment
10	Healthy Interior Performance
11	Access to Nature
12	Responsible Materials
13	Red List
14	Responsible Sourcing
15	Living Economy Sourcing
16	Net Positive Waste
17	Universal Access
18	Inclusion
19	Beauty + Biophilia
20	Education + Inspiration

ALL CORE IMPERATIVES

Water

06 Net Positive Water

Energy

08 Net Positive Carbon

Materials

13 Red List

14 Responsible Sourcing

15 Living Economy Sourcing

16 Net Positive Waste

CORE Certification



It is recommended to certify the palace under CORE certification, by the International Living future Institute, The Core Green Building CertificationSM (Core) is a simple framework that outlines the 10 best practice achievements that a building must obtain to be considered a green or sustainable building. It puts the connection to nature, equity and the need for a building to be loved on even footing with the typical water, energy and materials concerns. Core seeks to rapidly diminish the gap between the highest levels of established green building certification programs and the aspirations of the Living Building Challenge

Certification is based on actual, not modeled, performance. Complete documentation requirement must be submitted. The certification process is as following;

1. REGISTRATION
 - Online and it costs (\$900 US)(approx. 15,000 EGP)
2. DOCUMENTATION
 - Provide 12 months of performance data on the project's achievement to staff.
3. AUDIT
 - A third-party auditor will conduct an independent review of the project's performance data, to prove that it has truly achieved the CORE certification requirements
4. CERTIFICATION
 - If the auditor and staff determine the project meets requirements, it will be certified! Certification cost depends on the project area, in our case it will not be more that 5000 USD (approx. 80,000 EGP)

References

- LEED Rating System
- The Living Building Challenge Standard
- Fitwel Building Standard
- WELL Building Standard
- Tarsheed Rating System
- EPA reference



Glazing Proposal



INTRACO U.A.E. LIMITED

P.O.BOX 16895, JEBEL ALI FREE ZONE, DUBAI, U.A.E.

TEL: (04) 8814333, FAX: (04) 8813320, EMAIL: INTRACO@EMIRATES.NET.AE

22 JULY 2020

SUBJECT : PERFORMANCE DATA

	6MM GLASTROSC SILVERSTAR SUPERSELEKT 60/27 T ON CLEAR (#2) 16MM AIRSPACE 6MM CLEAR	
CHARACTERISTICS		
VISIBLE LIGHT		
TRANSMISSION (%)		59
REFLECTION-OUT (%)		15
REFLECTION-IN (%)		16
SOLAR ENERGY		
TRANSMISSION (%)		22
REFLECTION-OUT (%)		43
U-VALUE		
SUMMER (BTU/HR/SQ.FT/F)		0.29
(W/SQ.M/K)		1.30
SOLAR HEAT GAIN CO-EFFICIENT		0.25
SHADING CO-EFFICIENT		0.29

***CALCULATIONS ARE BASED ON THE STANDARDS ANSI/NFRC 100-2014, ANSI/NFRC 200-2014
AND NFRC 300-2014.***

The Saffron Palace

PV Solar Quotation On-Grid System (100 kW)

Initial Report

Date : 28-07-2020

Edition : 01

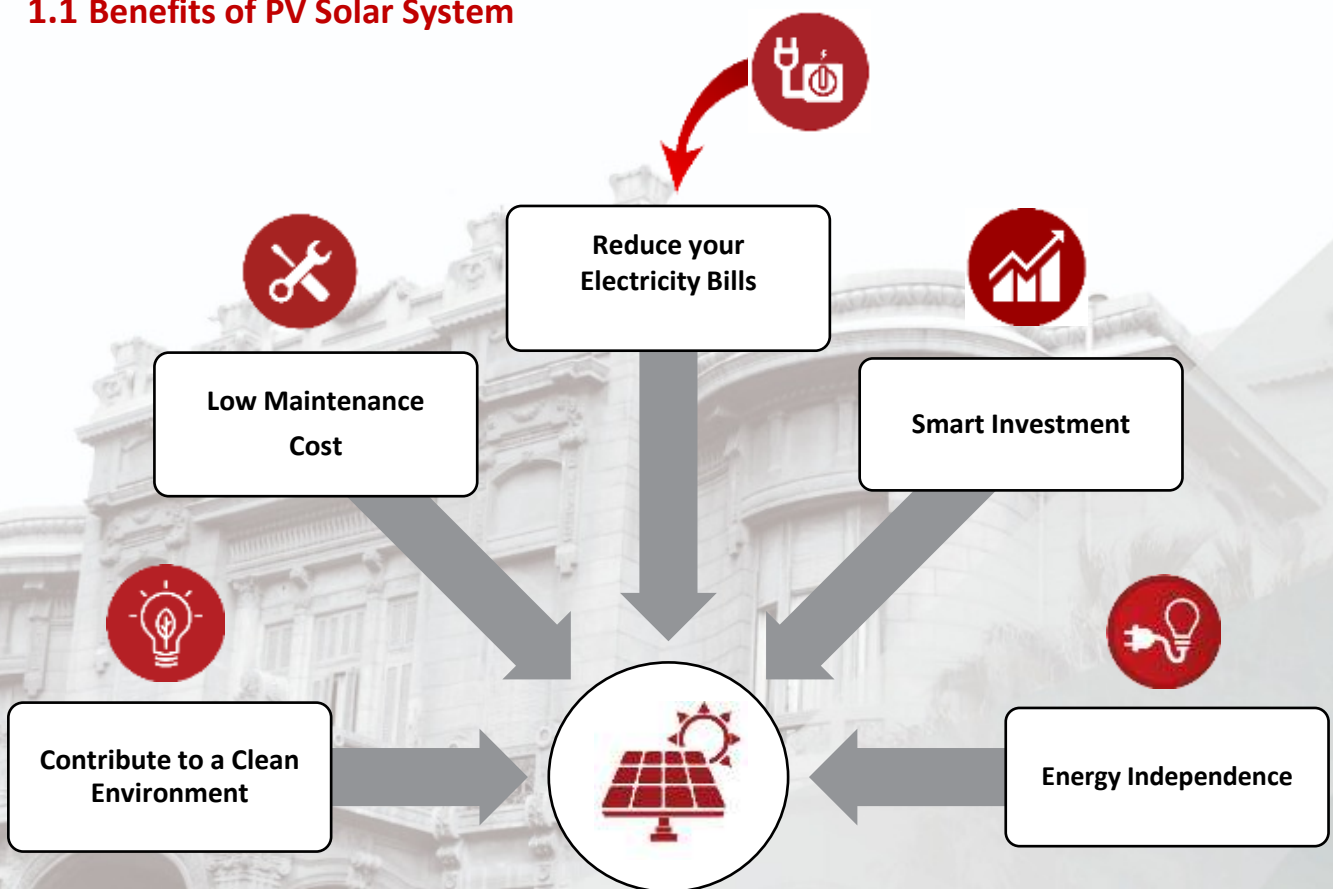
1. Introduction

With the ever-increasing demand for energy, the search for alternative energy sources has increased. The worldwide use of fossil fuels has led to the critical situation of global warming, significantly affecting our health, environment and climate. Extensive emphasis has been put on the implementation of renewable energy sources. Solar energy is by far the most abundant form of renewable energy and has the potential to partially replace fossil fuels.

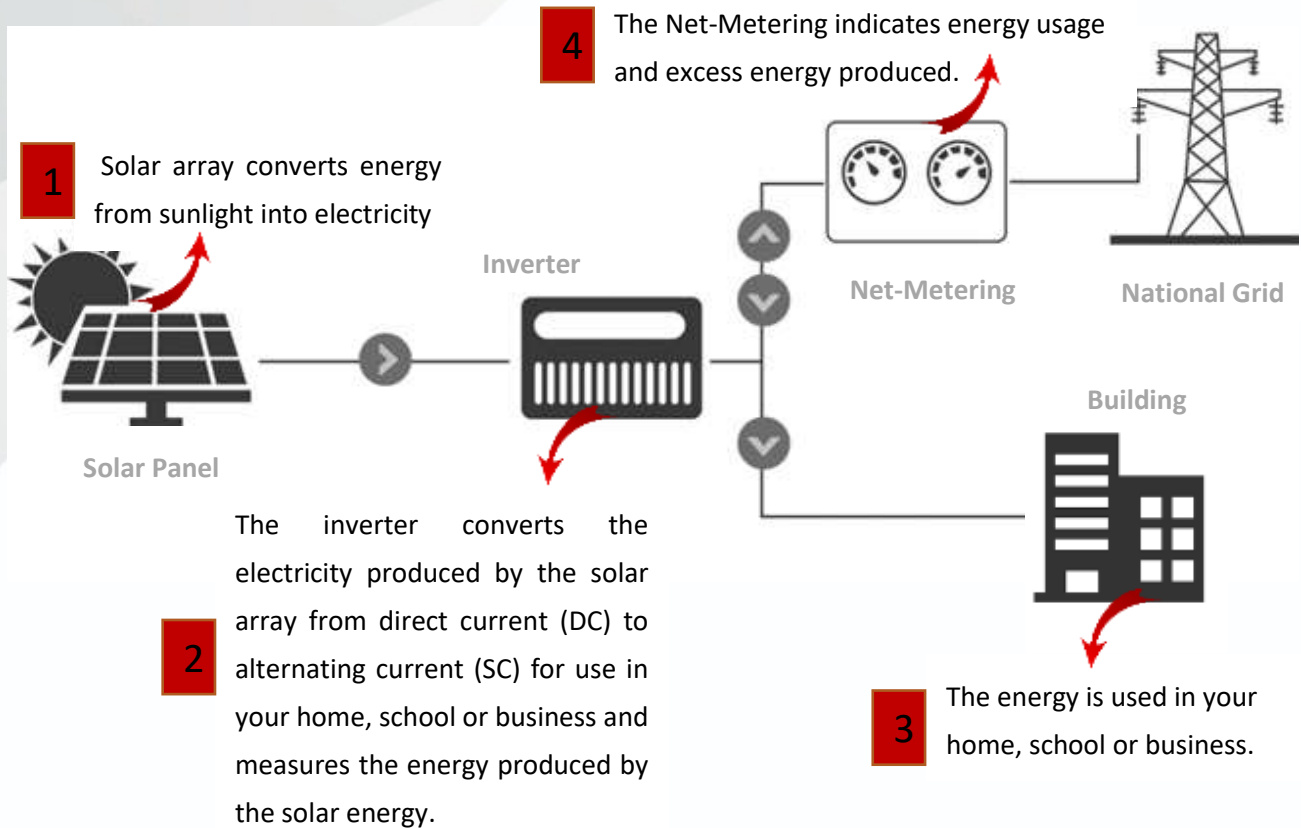
Solar has entered the mainstream in the past decade, corporations and institutions with massive energy bills have started to realize how much money they can save by switching to solar power as switching to solar power means hedging against rising utility rates and securing low, predictable electricity costs for years into the future.

Although installing photovoltaic (PV) panels offers a number of environmental benefits, the main reason customers go solar is the savings, as it reduces your monthly utility bills immediately starting on Day 1, with a large enough PV installation, it is possible to receive zero electricity bills. Some solar customers even receive negative utility bills, Because of this; solar energy is an investment – not a traditional expense.

1.1 Benefits of PV Solar System



1.2 How PV Solar System works



- Excess electricity can be stored in a battery or fed back into the National grid.
- Additional electricity can be pulled from the grid if you need more power than your solar panels can generate.

Net Metering Scheme:

According to the Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA) for Net Metering System (Attached) the net metering is a solar incentive that allows to store energy in the electric grid. When the solar panels produce excess power, that energy is sent to the grid and in exchange can pull from the grid when the system is under-producing like during nighttime.



When the PV system generates more power than needed, the owner can export the surplus to the grid. The settlement is made on a monthly basis and in the case of a surplus; this is considered a credit (kWh) in the customer's account and can be used in the following months. If there is still an electricity surplus by the end of the year, the off-taker (the electricity company) will buy it with an agreed price.

2. Project Overview

2.1 Site Consideration:

A site survey has been conducted for the Saffron Palace on Saturday (19-07-2020) to determine the capacity of the PV Solar station to feed the connected loads by generating electricity to reduce the energy needed from the electricity company.

The area of the roof approximately equals to 1400 m², the roof area is flat with south-facing surfaces and specified of high direct normal solar radiation with no shading.



Location:

Longitude : 30.076920,
Latitude : 31.284416

2.2 PV Solar System Sizing & Electrical Calculation Analysis

- Electricity Bill analysis from January till June 2020

Months	Previous Reading	Current Reading	Power Consumption (kWh)	Power Consumption (EGP)
Jan-20	4318767	4341684	22917	28,646
Feb-20	4341684	4367716	26032	32,540
Mar-20	4367716	4392955	25239	31,549
Apr-20	4392955	4419135	26180	32,725
May-20	4419135	4436160	17025	21,281
Jun-20	4436160	4457703	21543	26,929
Average Monthly Power Consumption		kWh	23156	
Average Monthly Power Consumption		EGP	28,945	
Average Daily Power Consumption		kWh	771.8666667	
Peak Sun Hour *		kWh/m²/d	5.66	
Required PV solar Plant		kW	136.3722026	
Recommended PV Solar Plant		kW	100 kW	
Required Area for the PV installation		m²	~ 800- 1000	

(*) – Solar Radiation according to the location of the Saffron Palace.

- Electricity Bill analysis after installing the PV Solar Plant

Average Monthly Power Production	kWh	16980
Average Net Power Consumption	kWh	6176
kWh Price (2020/2021)	(Pt./kWh)	1.25
Average Net Power Consumption	EGP	7720
Monthly Savings	EGP	21,225.00
Monthly Savings	%	73.3287269
Estimated Cost for the PV Solar Plant	EGP	1,350,000
ROI	Years	5.3

Roof Area



Equivalent Design



3. B.O.Q

No.	Item	Description		Quantity
1	PV Module	Module Manufacturer	Trina Solar	345
		PV Technology	The Honey Framed 60 layout Module – Half Cell Design	
		Peak Power Watts (Wp)	290	
		Maximum Efficiency	17.6%	
		Warranty	10 years product workmanship warranty	
			25 years linear performance warranty	
2	Inverter	Module Manufacturer	ABB	2
		Model Serial	TRIO-TM-50.0/60.0	
		Max. Efficiency	98.3%	
		No. of MPPT	2	
		Warranty	5 Years	
3	Cables	AC Cables	El-Sewedy	L.S
		DC Cables	KBE- German	
		Warranty	30 years even under difficult external conditions	
4	Protection	AC Protection	Schneider Electric	L.S
		DC Protection	FEEO CB - SUNTREE or Equivalent	
		MC4	Certified MC4 and TUV certified connectors are used in all welds and connections	
5	Combiner Box & Accessories			L.S
6	Installation, Commissioning & Testing			L.S

Total Quotation Cost equals to 1,350,000 EGP

(Only One Million Three Hundred Fifty Thousand Egyptian Pounds)

(Attached all the Technical Data Sheets for the a/m B.O.Q)

4. Terms and Conditions

Prices

- This Quotation includes the price of the design, supply, Installation, testing, commissioning and the Earthing of PV Solar Station of rated capacity of (100 kW).
- This Price is subjected to change in any case of changing of the VAT, Taxes or customs fees.
 - **This offer excludes the followings:**
 - % VAT Value.
 - The Net- metering fees (kWh Meter) of the electricity company.
 - Any Civil Works.
 - Any other items not clearly mentioned in the B.O.Q.

Payment Terms

- 50% Signing Contract
- 30 % after delivery.
- 15% after installation
- 5% after testing and operation.

Execution Period

- Should be clearly stated from date of Award.

Validity

- This Quotation is valid for Two Weeks from issue date.

Authorized By : Eng. Noha Sayed Ayoub

Checked By : Eng. Mostafa Ali

Attachments



Net- Metering Scheme





كتاب دوري رقم (٣) لسنة ٢٠١٧
بشأن

تعديل الكتاب الدوري رقم (١) لسنة ٢٠١٧

الخاص بالقواعد التنظيمية لتشجيع تبادل واستخدام الطاقة الكهربائية المنتجة من الطاقة الشمسية

بتاريخ ٢٩/٨/٢٠١٧ وافق مجلس إدارة الجهاز بجلسته الثانية للعام المالي ٢٠١٧/٢٠١٨ على التعديلات الواردة بالمذكرة المعروضة على المجلس الموقر على الكتاب الدوري رقم (١) لسنة ٢٠١٧ بشأن القواعد التنظيمية لتشجيع تبادل واستخدام الطاقة الكهربائية المنتجة من الطاقة الشمسية بنظام صافي القياس لتكون على النحو التالي:

١. قيام شركة توزيع/ نقل الكهرباء المختصة بتركيب العداد ثنائي الاتجاه اللازم لدى المشترك حيث يسمح للمشارك بتركيب وتوصيل محطة خلايا شمسية بنظام صافي القياس بقدرة لا تتعدى ٢٠ م.و. للمحطة الواحدة على أن يتحمل المشترك تكلفة هذا العداد وتتم المحاسبة الشهرية عن الإستهلاك على أساس صافي الطاقة المشتراه (Net Metering).

٢. في حالة زيادة الطاقة الموردة من المشترك إلى شركة التوزيع/النقل خلال شهر (س) عن الطاقة التي تم تغذيته بها من الشركة (ص)، يتم تسوية صافي كمية الطاقة المتبادلة (س- ص) مع الكمية التي يتم تغذيته بها في الشهر الذي يليه ويتم محاسبته طبقاً للشرائح المقابلة لصافي الإستهلاك، وفي حالة تكرار وجود فائض بعد التسوية يتم إضافة هذا الفائض لرصيد المشترك للشهور التالية من السنة.

٣. في حالة وجود رصيد للمشارك في نهاية العام المالي بعد عمل التسوية لإستهلاكه في نهاية شهر يونيو من كل عام ميلادي، تقوم شركة التوزيع/النقل بشراء هذا الفائض بسعر يكافئ متوسط تكلفة الطاقة الكهربائية المنتجة طبقاً لآخر تقرير لتكلفة الخدمة الذي يصدر عن الجهاز (٧١,٤ قرش/ك.و.س للعام ٢٠١٧/٢٠١٨)، على أن يتم تحديث السعر بشكل سنوي لكل من المشروعات القائمة والمشروعات الجديدة بالتزامن مع تحديث تكلفة الإنتاج طبقاً لتقرير تكلفة الخدمة الذي يصدر عن الجهاز بشكل سنوي.

٤. يقوم جهاز تنظيم مرفق الكهرباء وحماية المستهلك بإصدار شهادات المصدر للطاقة للمشارك وذلك بإصدار شهادة واحدة لكل م.و.س بشرط أن لا يقل إنتاج المشارك من الطاقة الشمسية خلال شهر عن (١) م.و.س، وتهدف الشهادة - عن طريق إعلام المستهلك النهائي بمصدر الطاقة المستهلكة- إلى تحفيز إستهلاك الطاقة المنتجة من مصادر متجددة عن طريق بيع وشراء هذه الشهادات.

وبناءً على ذلك فقد رأينا ضرورة النشر للعمل بمقتضى هذه التعديلات وفقاً لما تقدم،،،

تحريراً في ٢٠١٧/٩/٦



الرئيس التنفيذي

ح.م.ع.م.ع.

المهندس/ حاتم محمد



كتاب دوري رقم (٢) لسنة ٢٠٢٠
بشأن
الضوابط المنظمة لنظام صافي القياس

رقم جلسة مجلس الإدارة	التاسعة
العام المالي	٢٠٢٠/٢٠١٩
التاريخ	٢٠٢٠/٤/٢٨
رقم القرار	(١/١)
القواعد طبقاً لقرار مجلس إدارة الجهاز	قرر المجلس الموافقة على العمل بالضوابط المنظمة لنظام صافي القياس المعروضة بالجلسة، على أن يسري العمل بهذه الضوابط من اليوم التالي لتاريخ نشرها على الموقع الإلكتروني للجهاز ويُلغى كل ما يخالفها.

■ نُشر على الموقع الإلكتروني للجهاز يوم الثلاثاء الموافق ٢٠٢٠/٥/١٩

الرئيس التنفيذي

الدكتور مهندس/ محمد عبد العزيز حسن عبد الرحمن



ضوابط القواعد التنظيمية لتبادل واستخدام الطاقة الكهربائية المنتجة من الطاقة الشمسية
والمتعاقدين عليها بنظام صافي القياس (Net Metering)

١. ضرورة أن يكون موقع مشروع المحطة التي يتم التعاقد عليها بنظام صافي القياس داخل حدود عقار العميل.
٢. ألا يكون العميل المتعاقد بنظام صافي القياس مخصصاً له بتوزيع الكهرباء لذات المشروع.
٣. ألا تتجاوز أجمالي القدرات المركبة لمحطات الطاقة الشمسية المرتبطة بشبكة شركة التوزيع الواحدة، والمتعاقد عليها بنظام صافي القياس عن ١,٥% من الحمل الأقصى لشركة التوزيع المسجل بعدادات القياس خلال العام المالي السابق للتعاقد.
٤. وضع حد أقصى لإجمالي قدرات مشروعات الطاقة الشمسية التي سيتم التعاقد عليها بنظام صافي القياس في جميع أنحاء الجمهورية وبعد نفاذ هذه القواعد (على ألا يتجاوز إجمالي تلك القدرات ٣٠٠ ميغا وات متضمنة القدرات القائمة حالياً) كما يلي:
 - ١٢٥ ميغاوات للقدرات أقل من أو تساوي ٥٠٠ كيلووات.
 - ١٠٠ ميغاوات للقدرات أكبر من ٥٠٠ كيلووات وحتى ٢٠ ميغاوات.
٥. ألا تتجاوز القدرة المركبة للمحطة - المتعاقد عليها بنظام صافي القياس - الحمل الأقصى لاستهلاك العميل خلال العام المالي السابق لتاريخ التشغيل التجاري لتلك المحطة.
٦. ألا تتجاوز إجمالي القدرات الشمسية المتعاقد عليها بنظام صافي القياس والمملوكة لأية جهة مرخصة أو أحد عملاء شركات التوزيع والمرتبطة بشبكات التوزيع عن ٢٥ ميغاوات، وبحد أقصى ٢٠ ميغاوات للمشروع الواحد.
٧. في حالة الربط على شبكة الجهد المتوسط يجب إجراء دراسة إضافية بواسطة شركة التوزيع أو بالاستعانة بالغير لتقييم التأثير على الشبكة وذلك على نفقة العميل، على أن يتم التأكد من عدم وجود تيار عكسي يغذي شبكات النقل التابعة للشركة المصرية لنقل الكهرباء أو أحد عملاتها في أي حال من الأحوال.
٨. تتم المحاسبة على فائض الطاقة المنتجة من المحطة الشمسية المتعاقد عليها بنظام صافي القياس سنوياً، بعد تسوية استهلاكات العميل في نهاية شهر يونيو من كل عام ميلادي، بسعر شراء الطاقة (قرش/ك.و.س) طبقاً لآخر سعر شراء متعاقد عليه بين الشركة المصرية لنقل الكهرباء ومنتج طاقة شمسية.
٩. يقوم العميل بسداد مقابل لدمج الطاقة المنتجة (مقابل الدمج) يمثل تكلفة دمج الطاقات المتجددة في الشبكة (حسب جهدها) يحدده الجهاز ويراجع ويعدل بشكل دوري.
١٠. تسري هذه القواعد من اليوم التالي لتاريخ نشرها على الموقع الإلكتروني للجهاز ويلغى كل نص يخالف ذلك.

الرئيس التنفيذي

دكتور مهندس/ محمد عبد العزيز حسن عبد الرحمن

Technical Data Sheets



PV Solar Module



THE

Honey

FRAMED 60 LAYOUT MODULE

60 LAYOUT
MULTICRYSTALLINE**285-300W**
POWER OUTPUT RANGE**17.6%**
MAXIMUM EFFICIENCY**0~+5W**
POSITIVE POWER TOLARANCE

Founded in 1997, Trina Solar is the world's leading total solutions provider for solar energy. With local presence around the globe, Trina Solar is able to provide exceptional service to each customer in each market and deliver our innovative, reliable products with the backing of Trina as a strong, bankable brand. Trina Solar now distributes its PV products to over 100 countries all over the world. We are committed to building strategic, mutually beneficial collaborations with installers, developers, distributors and other partners in driving smart energy together.

**Comprehensive Products
And System Certificates**

IEC61215/IEC61730/UL1703/IEC61701/IEC62716
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse gases Emissions Verification
OHSAS 18001: Occupation Health and Safety Management System



PRODUCTS | POWER RANGE
TSM-PE06H | 285-300W

**Ideal for large scale installations**

- Reduce BOS cost with higher power bin and 1500V system voltage

**Half-cell design brings higher efficiency**

- Low thermal coefficients for greater energy production at high operating temperature
- Low cell connection power loss due to half-cell layout (120 multicrystalline)

**Highly reliable due to stringent quality control**

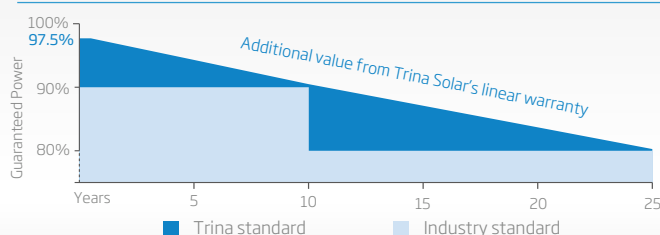
- Over 30 in-house tests (UV, TC, HF etc)
- Internal test requirement of Trina more stringent than certification authority
- PID resistant
- 100% EL double inspection

**Certified to withstand the most challenging
environmental conditions**

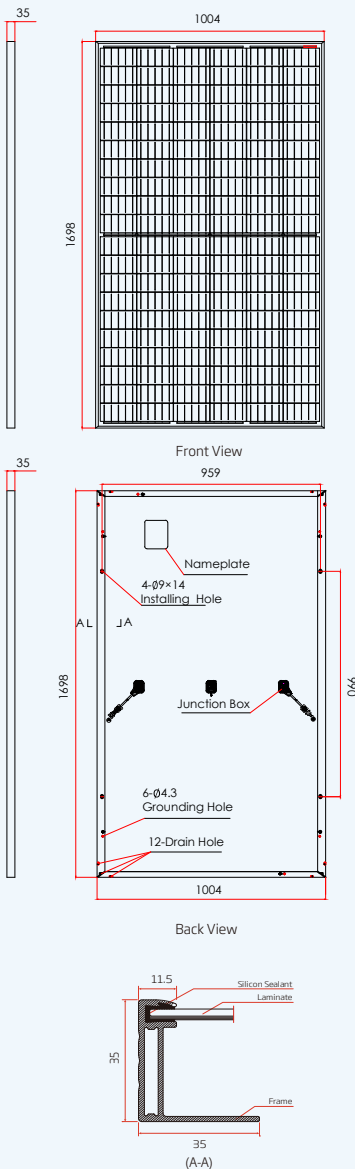
- 2400 Pa negative load
- 5400 Pa positive load
- * 2400/5400 is the measured load, and the safety factor is 1.5 times

LINEAR PERFORMANCE WARRANTY

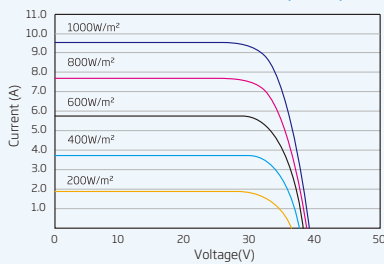
10 Year Product Warranty · 25 Year Linear Power Warranty



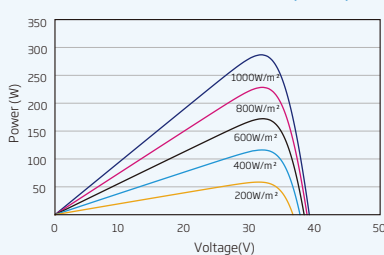
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(290W)



P-V CURVES OF PV MODULE(290W)



ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp) *	285	290	295	300
Power Output Tolerance-PMAX (W)	0 ~ +5			
Maximum Power Voltage-VMPP (V)	31.5	31.8	32.1	32.3
Maximum Power Current-IMPP (A)	9.05	9.12	9.19	9.29
Open Circuit Voltage-VOC (V)	38.8	39.2	39.5	39.8
Short Circuit Current-ISC (A)	9.53	9.60	9.67	9.77
Module Efficiency η_m (%)	16.7	17.0	17.3	17.6

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Measuring tolerance: ±3%.

ELECTRICAL DATA (NMOT)

Maximum Power-PMAX (Wp)	216	219	223	227
Maximum Power Voltage-VMPP (V)	29.8	30.1	30.4	30.6
Maximum Power Current-IMPP (A)	7.24	7.29	7.35	7.42
Open Circuit Voltage-VOC (V)	36.5	36.9	37.2	37.4
Short Circuit Current-ISC (A)	7.69	7.74	7.80	7.88

NMOT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Multicrystalline
Cell Orientation	120 cells (6 × 20)
Module Dimensions	1698 × 1004 × 35 mm (66.85 × 39.53 × 1.38 inches)
Weight	18.7kg (41.2 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant Material	EVA
Backsheet	White
Frame	35 mm (1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: N 140mm/P 285mm(5.51/11.22inches) Landscape: N 1200 mm / P 1200 mm (47.24/47.24 inches)
Connector	TS4

TEMPERATURE RATINGS

NMOT (Nominal Module Operating Temperature)	41°C (±3°C)
Temperature Coefficient of PMAX	- 0.38%/°C
Temperature Coefficient of VOC	- 0.31%/°C
Temperature Coefficient of ISC	0.05%/°C

(DO NOT connect Fuse in Combiner Box with two or more strings in parallel connection)

WARRANTY

- 10 year Product Workmanship Warranty
- 25 year Linear Power Warranty

(Please refer to product warranty for details)

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	20A

PACKAGING CONFIGURATION

- Modules per box: 30 pieces
- Modules per 40' container: 720 pieces



Inverter



SOLAR INVERTERS

ABB string inverters

TRIO-TM-50.0-400/TRIO-TM-60.0-480

50 to 60 kW



The TRIO-TM-50.0/60.0 is ABB's latest three-phase string solution for cost efficient large decentralized photovoltaic systems for both commercial and utility applications.

—
TRIO-TM-50.0/60.0
outdoor string inverter

This new addition to the TRIO family, with 3 independent MPPT and power ratings of up to 60 kW (480 V version), has been designed with the objective to maximize the ROI in large systems with all the advantages of a decentralized configuration for both rooftop and ground-mounted installations.

Modular design

The TRIO-TM-50.0/60.0 has a modular design to guarantee maximum flexibility, thanks to the different versions available.

The separate and configurable AC and DC compartments increase the ease of installation and maintenance with their ability to remain separately wired from the inverter module inside the system. The TRIO comes with the most complete wiring box configurations available including up to 15 DC inputs with fast connectors, string protection fuses, AC and DC switches and type II AC and DC surge arresters.

Design flexibility

The double stage conversion topology offers the advantage of a wide input voltage range for maximum flexibility of system design.

The TRIO-TM comes with a forced air cooling system, used also in the previous TRIO products, designed for a simple and fast maintenance, allowing a maximum flexibility of plant design. The inverter comes with mounting supports for both horizontal and vertical installations, which allow for the best use of space available beneath the solar panels.

Embedded multi communication interfaces (WLAN,

Ethernet, RS485) combined with a Sunspec compliant Modbus protocol (RTU/TCP) allow the inverter to be easily integrated with any third party monitoring and control systems.

Improved commissioning and maintenance

Thanks to the build-in Web User Interface (WUI) the installer can commission the inverter wirelessly and change advanced parameters by using any standard WLAN enabled device (smartphone, tablet or PC). Integrated logging capability allows remote monitoring of the plant without the need of any additional external loggers.

Remote firmware update of the inverter system and components via Aurora Vision®.

Highlights

- 3 Independent MPPT
- Transformerless inverter
- Double stage topology for a wide input range
- Large set of specific grid codes available which can be selected directly in the field
- Separate AC and DC compartments are available in different configurations
- Both vertical and horizontal installation
- 2 available sizes, 50 and 60 kW with 400 and 480 Vac of output voltage, respectively
- Wireless access to embedded user interfaces
- Ethernet daisy chain enabled
- Modbus TPC/RTU Sunspec compliant
- Remote monitoring and firmware update via Aurora Vision® (logger free)
- Lifetime free of charge access to Aurora Vision

ABB string inverters

TRIO-TM-50.0-400

TRIO-TM-60.0-480

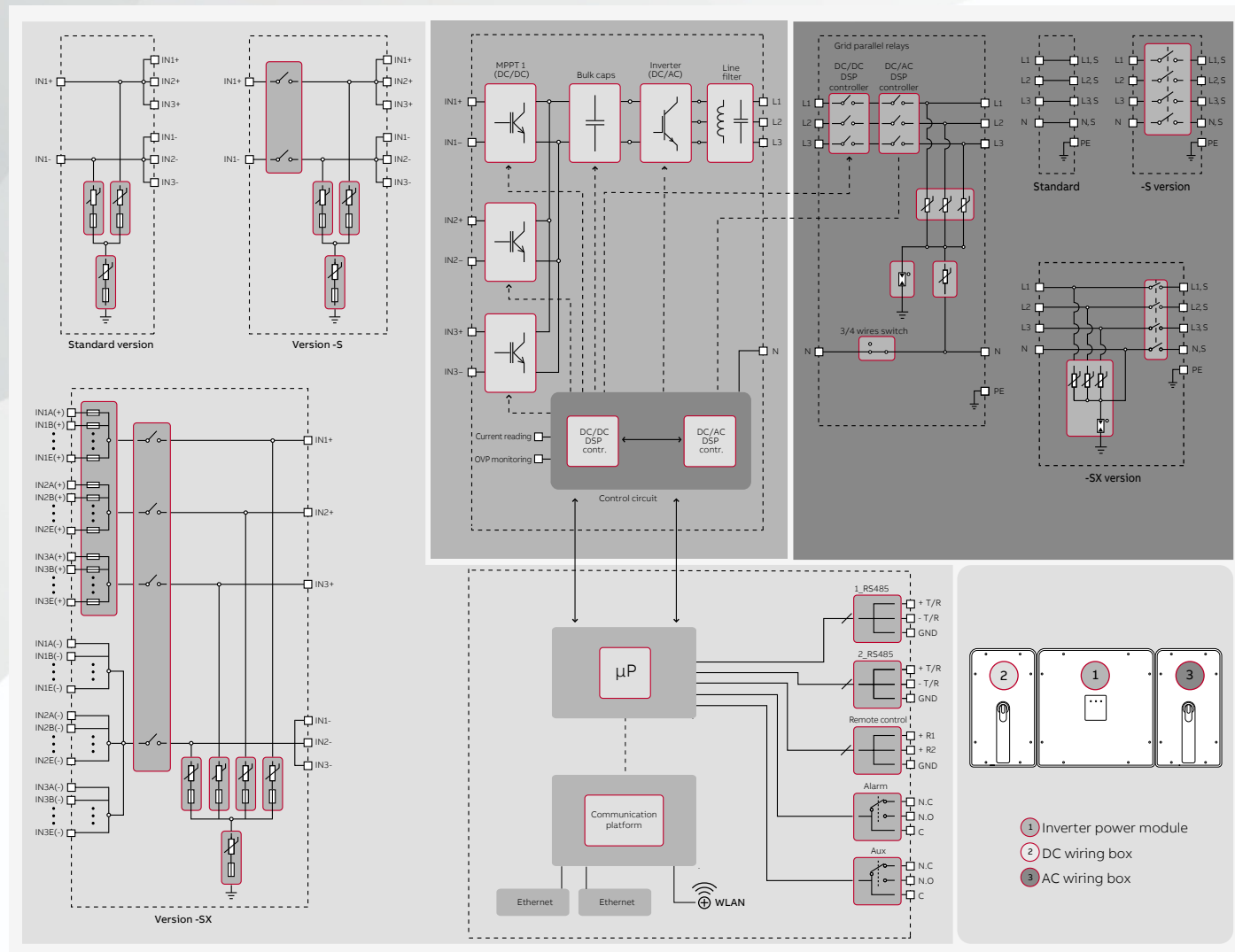
50 to 60 kW



Technical data and types

Type code	TRIO-TM-50.0-400	TRIO-TM-60.0-480
Input side		
Absolute maximum DC input voltage ($V_{max,abs}$)	1000 V	
Start-up DC input voltage (V_{start})	420...700 V (Default 420 V)	420...700 V (Default 500 V)
Operating DC input voltage range ($V_{dcmin}...V_{dcmax}$)	0,7x V_{start} ...950 V (min 300 V)	0,7x V_{start} ...950 V (min 360 V)
Rated DC input voltage (V_{dcr})	610 Vdc	720 Vdc
Rated DC input power (P_{dcr})	52000 W	61800 W
Number of independent MPPT	3 (SX and SX2 version) / 1 (standard and S version)	
Number of MPPT in parallel mode	1	
Maximum DC input power for each MPPT ($P_{MPPT,max}$)	17500 W	21000 W
MPPT input DC voltage range ($V_{MPPTmin} \dots V_{MPPTmax}$) at P_{acr}	480-800 Vdc	570-800 Vdc
Maximum DC input current (I_{dcmax}) for each MPPT	36 A	
Maximum input short circuit current for each MPPT	55 A (165 A in case of parallel MPPT)	
Number of DC input pairs for each MPPT	5	
DC connection type	Screw terminal block (Standard and -S version) or PV quick fit connector ³⁾ (-SX and SX2 version)	
Input protection		
Reverse polarity protection	Yes, from limited current source	
Input over voltage protection for each MPPT - varistor	Yes, 1 for each MPPT	
Input over voltage protection for each MPPT - plug-in modular surge arrester	Type 2 (option) with monitoring	
Photovoltaic array isolation control	According to local standard	
DC switch rating for each MPPT (version with DC switch)	60 A / 1000 V for each MPPT (180 A in case of parallel MPPT)	
Fuse rating (version with fuses)	15 A / 1000 V	
Output side		
AC grid connection type	Three-phase (3W+PE or 4W+PE)	
Rated AC power (P_{acr} @ $\cos\phi=1$)	50000 W	60000 W
Maximum AC output power (P_{acmax} @ $\cos\phi=1$)	50000 W	60000 W
Maximum apparent power (S_{max})	50000 VA	60000 VA
Rated AC grid voltage ($V_{ac,r}$)	400 V	480 V
AC voltage range	320...480 V ¹⁾	384...571 V ¹⁾
Maximum AC output current ($I_{ac,max}$)	77 A	
Contributory fault current	92 A	
Rated output frequency (f_r)	50 Hz / 60 Hz	
Output frequency range ($f_{min}...f_{max}$)	47...53 Hz / 57...63 Hz ²⁾	
Nominal power factor and adjustable range	> 0.995; 0...1 inductive/capacitive with maximum S_{max}	
Total current harmonic distortion	<3%	
AC connection type	Screw terminal block, cable gland	
Output protection		
Anti-islanding protection	According to local standard	
Maximum external AC overcurrent protection	100 A	
Output overvoltage protection - varistor	Yes	
Output overvoltage protection - plug-in modular surge arrester	Type 2 (option) with monitoring	
Operating performance		
Maximum efficiency (η_{max})	98.3%	98.5%
Weighted efficiency (EURO)	98.0% / -	98.0% / -
Communication		
Embedded communication interfaces	2x RS485, 2x Ethernet (RJ45), WLAN (IEEE802.11 b/g/n @ 2,4 GHz)	
Communication protocols	Modbus RTU / TCP (Sunspec compliant); Aurora Protocol	
Remote monitoring services	Standard level access to Aurora Vision monitoring portal	
Advanced features	Integrated Web User Interface; Display (option); Embedded logging and direct transferring of data to Cloud	
Environmental		
Ambient temperature range	-25...+60°C (-13...140 °F) with derating above 45 °C (113 °F)	-25...+60°C (-13...140 °F) with derating above 45 °C (113 °F)
Relative humidity	4%... 100% condensing	
Sound pressure level, typical	75 dB(A) @1 m	
Maximum operating altitude	2000m / 6561ft	
Physical		
Environmental protection rating	IP65 (IP54 for cooling section)	
Cooling	Forced air	
Dimension (H x W x D)	725 mm x 1491 mm x 315 mm / 28.5" x 58.7" x 12.4"	
Weight	95 kg / 209 lbs overall, 66 kg / 145 lbs electronic compartment, 15 kg / 33 lbs AC wiring box (full optional), 14kg / 31 lbs DC wiring box (full optional)	
Mounting system	Wall bracket, horizontal support	

ABB TRIO-TM-50.0-400 / TRIO-TM-60.0-480 string inverter block diagram



Technical data and types

Type code	TRIO-TM-50.0-400	TRIO-TM-60.0-480
Safety		
Isolation level	Transformerless	
Marking	CE	
Safety and EMC standard	IEC/EN 62109-1, IEC/EN 62109-2, EN 61000-6-2, EN 61000-6-3, EN 61000-3-11, EN 61000-3-12	
Grid standard (check your sales channel for availability)	CEI 0-21, CEI 0-16, DIN V VDE V 0126-1-1, VDE-AR-N 4105, G59/3, EN 50438 (not for all national appendices), RD 1699, RD 413, RD 661, P.O. 12.3, AS 4777, BDEW, NRS-097-2-1, MEA, PEA, IEC 61727, IEC 60068, IEC 61683, VFR-2014, IEC 62116	
Available product variants		
Inverter power module	TRIO-TM-50.0-400-POWER MODULE	TRIO-TM-60.0-480-POWER MODULE
DC wiring box options ⁴⁾		
Input connections with terminal blocks	DCWB-TRIO-TM-50.0-400	DCWB-TRIO-TM-60.0-480
Input connections with terminal blocks + DC switch	DCWB-S-TRIO-TM-50.0-400	DCWB-S-TRIO-TM-60.0-480
15 quick input connections + fuses (single pole) + DC switch ⁵⁾	DCWB-SX-TRIO-TM-50.0-400	DCWB-SX-TRIO-TM-60.0-480
15 quick input connections + fuses (both poles) + DC switch ⁵⁾	DCWB-SX2-TRIO-TM-50.0-400	DCWB-SX2-TRIO-TM-60.0-480
AC wiring box options		
AC output connections with terminal blocks	ACWB-TRIO-TM-50.0	ACWB-TRIO-TM-60.0
AC output connections with terminal blocks + AC switch ⁵⁾	ACWB-SX-TRIO-TM-50.0	ACWB-SX-TRIO-TM-60.0
Optional available		
TRIO-GROUNDING-KIT	Available	Available
TRIO-AC-WIRING-KIT	Available	Available

¹⁾ The AC voltage range may vary depending on specific country grid standards

²⁾ The Frequency range may vary depending on specific country grid standards

³⁾ Please refer to the document "String inverters – Product manual appendix" available at www.abb.com/solarinverters for information on the quick-fit connector brand and model used in the inverter

⁴⁾ DCWB with display is available as optional, with dedicated wiring box version

⁵⁾ Type 2 surge arresters available as optional, with dedicated wiring box version

Remark. Features not specifically listed in the present data sheet are not included in the product

For more information please contact
your local ABB representative or visit:

www.abb.com/solarinverters
www.abb.com

We reserve the right to make technical
changes or modify the contents of this
document without prior notice. With
regard to purchase orders, the agreed
particulars shall prevail. ABB AG does not
accept any responsibility whatsoever for
potential errors or possible lack of
information in this document.

We reserve all rights in this document and
in the subject matter and illustrations
contained therein. Any reproduction,
disclosure to third parties or utilization of
its contents – in whole or in parts – is
forbidden without prior written consent of
ABB AG. Copyright© 2017 ABB
All rights reserved



AC & DC Cables



0.6/1 (1.2) kV

Multicore Cables, with Stranded Copper
Conductors PVC Insulated and PVC Sheathed



Description

- Multicore cables of stranded Copper conductors are insulated with PVC compound rated 70°C, assembled together, covered with overall jacket of PVC compound.
- Cables are produced according to IEC 60502.

Application

- For outdoor and indoor installations in damp and wet locations.

Product - Code	Nominal Cross Sectional Area	Max. Conductor Resistance		Current Rating			Approx. Overall Diameter	Approx. Weight
		DC at 20 °C	AC at 70 °C	Laid Direct in Ground	Laid in Ducts	Laid in Free Air		
	mm ²	Ω/km	Ω/km	A	A	A	mm	kg/km
Two Core Cables								
CP1-T102-U04	1.5 rm	12.1000	14.600	24	19	20	10.1	120
CP1-T102-U06	2.5 rm	7.4100	8.870	30	25	28	10.9	145
CP1-T102-U08	4 rm	4.6100	5.540	40	32	39	12.9	205
CP1-T102-U09	6 rm	3.0800	3.690	50	40	50	13.9	255
CP1-T102-U10	10 rm	1.8300	2.190	65	55	66	15.0	425
CP1-T102-U11	16 rm	1.1500	1.390	85	65	88	17.0	580
CP1-T102-U12	25 rm	0.7270	0.870	110	85	116	20.0	845
CP1-T102-U13	35 rm	0.5240	0.628	130	105	143	22.2	1090
Three Core Cables								
CP1-T103-U04	1.5 rm	12.1000	14.600	21	18	18	10.6	145
CP1-T103-U06	2.5 rm	7.4100	8.870	27	23	22	11.5	190
CP1-T103-U08	4 rm	4.6100	5.540	35	30	31	13.6	270
CP1-T103-U09	6 rm	3.0800	3.690	45	36	39	14.7	340
CP1-T103-U10	10 rm	1.8300	2.190	60	48	53	16.4	485
CP1-T103-U11	16 rm	1.1500	1.390	75	60	72	18.6	685
CP1-T103-U12	25 rm	0.7270	0.870	100	80	94	21.8	995
CP1-T103-U13	35 rm	0.5240	0.628	120	95	110	24.2	1300
Four Core Cables								
CP1-T104-U04	1.5 rm	12.1000	14.6000	21	18	18	11.4	180
CP1-T104-U06	2.5 rm	7.4100	8.8700	27	23	22	12.4	230
CP1-T104-U08	4 rm	4.6100	5.5400	35	30	31	14.8	335
CP1-T104-U09	6 rm	3.0800	3.6900	45	36	39	16.0	425
CP1-T104-U10	10 rm	1.8300	2.1900	60	48	53	17.9	635
CP1-T104-U11	16 rm	1.1500	1.3900	75	60	72	20.3	880
CP1-T104-U12	25 rm	0.7270	0.8700	100	80	94	23.9	1295
CP1-T104-U13	35 rm	0.5240	0.6280	120	95	110	26.6	1700
CP1-T104-U14	50 sm	0.3870	0.4640	145	115	138	29.3	2225
CP1-T104-U15	70 sm	0.2680	0.3220	175	145	171	32.9	3065
CP1-T104-U16	95 sm	0.1930	0.2320	210	165	209	37.8	4175
CP1-T104-U17	120 sm	0.1530	0.1850	240	195	242	41.2	5205
CP1-T104-U18	150 sm	0.1240	0.1510	270	220	275	45.9	6400
CP1-T104-U19	185 sm	0.0991	0.1210	300	245	314	50.7	7960
CP1-T104-U20	240 sm	0.0754	0.0840	345	290	374	57.0	10330
CP1-T104-U30	300 sm	0.0601	0.0770	390	320	440	63.3	12915
CP1-T104-U40	400 sm	0.047	0.0606	453	376	507	70.1	16500
CP1-T104-U50	500 sm	0.0366	0.0491	510	429	566	77.6	21085

► cont'd

power in wire and cables



KBE Solar

**MADE IN
GERMANY**

**KBE Solar TÜV
TÜV PV1-F**

KBE Solar DB
Erdverlegbar / direct burial

KBE Solar HV 1500 V
TÜV PV1500DC-F

KBE Multinorm
TÜV PV1-F / UL 4703 (PV Wire)

customized • fast • flexible • cost-optimized

KBE Elektrotechnik GmbH • Symeonstraße 8 • 12279 Berlin • GERMANY

Tel: +49 (0)30 / 25 208-100 • Fax: +49 (0)30 / 25 208-140 • info@kbe-elektrotechnik.com • www.kbe-elektrotechnik.com



Die KBE Elektrotechnik GmbH ist Hersteller von Kabeln und Leitungen für die Solar-, Automobil- und Hausgeräteindustrie.

In unseren nach ISO TS 16949 zertifizierten Werken produzieren wir rund 1,5 Mio km Leitungen und verarbeiten ca. 20000 t Kupfer pro Jahr.

Das KBE Solarleitungsprogramm reicht von Standardleitungen, über erdverlegbare Leitungen bis hin zu Solarkabeln mit internationalen Zertifizierungen und Spannungen bis 1500 Volt.

Diese speziell auf Anforderungen im Bereich PV-Kraftwerke, Dachanlagen, Kabelkonfektion, Modulherstellung und Großhandel angepassten Solarleitungen werden auf modernsten Anlagen kostenoptimiert hergestellt.

Unsere KBE Solarleitungen sind gemäß TÜV und UL zertifiziert. Unsere vernetzten Spezialisierungen übertreffen die gestellten Anforderungen und erzielen eine hohe Lebensdauer und Einsatzsicherheit.

KBE Solarleitungen sind in verschiedenen Außendurchmessern erhältlich und damit kompatibel zu allen gängigen Steckern und Anschlussdosen. Unsere kurzen Lieferzeiten werden Sie überzeugen. Verschiedene Verpackungsgrößen erfüllen Ihre individuellen Anforderungen.

KBE Elektrotechnik GmbH is specialized in manufacturing electrical wires and cables for the photovoltaic, automotive, and household appliance industry.

All our plants are certified according to ISO TS 16949. We manufacture about 1.5 million km of wires and cables with 20000 tons of copper per year.

KBE's solar product range covers standard cables, PV-cables for direct burial, and voltages up to 1500 V. Our cables are certified according to TÜV and international standards.

Our solar cables are suitable for installations in PV power plants, roof systems, wire harnesses, and panel manufacturing while meeting the expectations of distributors. Our state-of-the-art production facilities guarantee a continuous cost optimization.

KBE solar cables are TÜV certified and UL Listed. The special cross-linked insulations exceed the test requirements to ensure long service time and high operating reliability.

KBE solar cables are available in many different outer diameters making them compatible with almost all connectors and junction boxes. Our capacity and short delivery time is outstanding while offering different packaging sizes to meet your individual requirements.



KBE Solar PV1-F – Datenblatt / Technical Data Sheet

Stand: 31.05.2013

Leiter / conductor

- E-Cu verzinkt nach IEC 60228 Klasse 5

- *E-Cu tinned acc. IEC 60228 Class 5*

Isolationsmaterial / insulation material

- Vernetztes Spezial Polyolefin
- 36 Shore D
- Halogenfrei
- Witterungs- und UV-beständig
- Ozonbeständig

- *Crosslinked Special Polyolefin*
- *36 Shore D*
- *Halogen free*
- *Weather- and UV-resistant*
- *Ozone resistant*

Mantelmaterial / jacket material

- Vernetztes Spezial Polyolefin
- 36 Shore D
- Halogenfrei
- Witterungs- und UV-beständig
- Ozonbeständig

- *Crosslinked Special Polyolefin*
- *36 Shore D*
- *Halogen free*
- *Weather- and UV-resistant*
- *Ozone resistant*

Temperaturbereich / temperature range

- -40°C bis +90°C
- max. Leitertemperatur: 126°C

- *-40°C to +90°C*
- *max. conductor temperature: 126°C*

Bemessungsspannung / voltage rating

- $U_0/U = 600/1000 V_{AC}$
- max. 1800 V_{DC} (Leiter/Leiter, nicht geerdetes System, unbelasteter Stromkreis)

- $U_0/U = 600/1000 V_{AC}$
- max. 1800 V_{DC} (conductor-conductor, non earthed system, circuit not under load)

Flammwidrigkeit / flame resistance

- Gemäß DIN EN 60332-1-2

- *Acc. to DIN EN 60332-1-2*

Farben / colours

- Schwarz, Rot, Blau

- *black, red, blue*

Richtlinien & Zertifikate / guidelines & certificates

- TÜV 2 PfG 1169/08.07, R 60027876
- RoHS 2002/95/EC

- *TÜV 2 PfG 1169/08.07, R 60027876*
- *RoHS 2002/95/EC*

Bedruckung / printing: KBE SOLAR PV1-F X,XX mm²

Querschnitt / cross section	Leiterauf- bau / conductor design	Widerstand / resistance	min. Wand- stärke Isola- tion / min. insulation thickness	min. Wand- stärke Mantel / min. jacket thickness	Außen Ø / outer Ø	Gewicht / weight	KBE Artikelnummer / item no.
[mm ²]	n x max- Ø [mm]	Rmax. [mΩ/m]	[mm]	[mm]	[mm]	[kg/km]	
2,5	50 x 0,260	8,210	0,5	0,5	4,60	46,0	730250015002UU
4,0	56 x 0,290	5,090	0,5	0,5	5,00	60,0	730400015001UU
6,0	80 x 0,310	3,390	0,5	0,5	5,60	80,0	730600015003UU
10,0	80 x 0,410	1,950	0,5	0,5	6,90	120,0	731000015004UU
16,0	120 x 0,410	1,240	0,5	0,5	8,10	185,0	731600015001UU
25,0	196 x 0,410	0,795	0,5	0,5	10,30	310,0	732500015001UU
35,0	280 x 0,410	0,565	0,5	0,5	11,40	410,0	733500015001UU

Verwendung

KBE Solar Leitung PV1-F ist gemäß Normbestimmungen für den frei beweglichen und frei hängenden Einsatz, als auch für feste Verlegung in Photovoltaiksystemen geeignet. Der Einsatzbereich ist unter anderem im Innenraum, im Freien, in der Industrie sowie in gewerblichen und in landwirtschaftlichen Betrieben an schutzisolierten Geräten und Anlagen (Schutzklasse II) vorgesehen. PV1-F Leitungen sind im Allgemeinen für die direkte Erdverlegung nicht vorgesehen. Hierfür empfehlen wir die erdverlegbare KBE Solarleitung DB.

Usage

KBE Solarcables are made for flexible and freely suspended installations as well as for fixed cable installations in solar PV power supply systems. They can be used indoors, outdoors, in commercial and industrial as well as agricultural installations or locations. The cables are suitable for use in applications and devices containing protective insulation (safety class II). PV1-F cables are in general not usable for direct burial. We recommend KBE Solar DB for direct burial.

Zertifikat

Certificate



Zertifikat Nr. *Certificate No.*
R 60027876

Blatt *Page*
0001

Ihr Zeichen *Client Reference*

Unser Zeichen *Our Reference*

Ausstellungsdatum

Date of Issue
(day/mo/yr)

0001-- 21138599 010

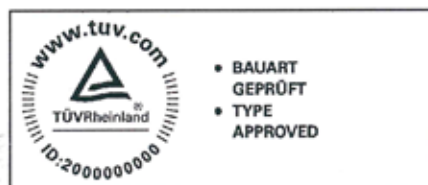
18.01.2010

Genehmigungsinhaber *License Holder*
KBE Elektrotechnik GmbH
Symeonstr. 8
12279 Berlin
Deutschland

Fertigungsstätte *Manufacturing Plant*
KBE Elektrotechnik GmbH
Symeonstr. 8
12279 Berlin
Deutschland

Prüfzeichen *Test Mark*

Geprüft nach *Tested acc. to*
2 PFG 1169/08.07



Zertifiziertes Produkt (Geräteidentifikation)
Certified Product (Product Identification)

Lizenzentgelte - Einheit
License Fee - Unit

PV-Leitungen

Bezeichnung: 1. KBE Solar
2. KBE Solar (V2)
Leitungscode: PV1-F
Bemessungsquerschnitt: 1. 2,5mm²; 4,0mm²; 6,0mm²; 10,0mm²
16,0mm²; 25,0mm²; 35,0mm²
2. 2,5mm²; 4,0mm²; 6,0mm²
Bemessungsspannung: AC 0,6/1,0 kV
max. Spannung: DC 1,8 kV
Temperaturbereich ta: -40°C bis +90°C
max. Leitertemperatur: +126°C (20.000h)
Farbe Isolierhülle: schwarz, weiß
Farbe Mantel: schwarz, rot, blau
Material Isolierhülle: Vernetztes Spezial Polyolefin
Material Mantel: Vernetztes Spezial Polyolefin

19

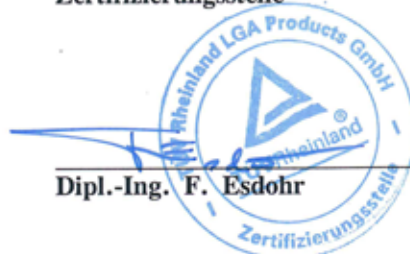
Ersetzt Zertifikat R_60024348

19

Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde und es bestätigt die Konformität des Produktes mit den oben genannten Standards und Prüfgrundlagen. Zusätzliche Anforderungen in Ländern, in denen das Produkt in Verkehr gebracht werden soll, müssen zusätzlich betrachtet werden. Die Herstellung des zertifizierten Produktes wird überwacht.
This certificate is based on our Testing and Certification Regulation and states the conformity of the product with the standards and testing requirements as indicated above. Any additional requirements in countries where the product is going to be marketed have to be considered additionally. The manufacturing of the certified product is subject to surveillance.

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg
Tel.: +49 221 806-1371 e-mail: cert-validity@de.tuv.com
Fax: +49 221 806-3935 http://www.tuv.com/safety

Zertifizierungsstelle



Ain Shams University

**Environmental Study
For Ain Shams University Field Hospital**



Prepared by:

Prof. Dr. Noha Samir Donia

Professor of Environmental Hydraulics
Vice-Dean of the Institute for Social
Service and Environmental Development
Institute of Environmental Studies and
Research
Approved Environmental Consultant

Dr. Hoda Hilal

Lecturer
Department of Environmental Economic,
Legal and Administrative Sciences
Deputy Manager of Scientific Calculation
Center
Institute of Environmental Studies and
Research
Approved Environmental Consultant

Contents of Study

1. General background on the Project, the objectives and scope of the study;
2. A list of the environmental laws applicable to the establishment of the field hospital, while setting the aspects specified by the legislation and the article numbers;
3. Full description of the field hospital;
4. Description of the field hospital area;
5. Analysis of the potential environmental impacts of the field hospital and mitigation measures;
6. Project alternatives;
7. Environmental management plan, monitoring and evacuation during the operational phase;
8. Emergency plan and occupational safety and health procedures;
9. Annex (1) - Form of Environmental Impact Assessment for the projects of Category (B);
10. Annex (2) - the facility's environmental record; and
11. Annex (3) Certificates of the Consultant.

1. General background on the Project and the objectives and scope of the study

Ain Shams University has witnessed rapid developments and leaps in the process of developing its health institutions of hospitals in order to provide health services to citizens, staff and faculty members at Ain Shams University.

In view of the conditions that the world is going through by the Corona Virus (Covid 19) crisis, the crises Egypt has gone through and the pressure of government hospitals, Ain Shams University has formed the idea of establishing Ain Shams University Field Hospital to provide quarantine health and treatment services for cases of infection with the new Corona Virus, as a national and humanitarian role to deepen the role of Ain Shams University as an integral part of the health system.

Service areas include the following:

1. Patients with epidemic virus who are working at Ain Shams University
2. Patients with epidemic virus associated with pathological complications.
3. Patients with epidemic virus who were diagnosed with it while receiving treatment for other illness reasons inside Ain Shams University Hospitals.

This study aims to:

- Evaluate the environmental facts of Ain Shams University Field Hospital as an expanded medical model that serves all citizens, staff and faculty members.
- Shed light on the environmental issues facing Ain Shams University Field Hospital.
- Identify the amount of liquid waste, whether in terms of treating the liquid wastes presented or in terms of whether there are treatment units for those wastes.
- Identify the ways to deal with medical waste and solid waste.
- Control air quality in the hospital work environment.
- Develop a plan for environmental management and environmental monitoring within the Hospital.

The main points of the study

The current Environmental Impact Assessment (EIA) study includes the following chapters:

- Chapter (1): General background on the Project, the objectives and scope of the study
- Chapter (2): Laws and legislations applicable to project activities

- Chapter (3): Description of the main environment
- Chapter (4): Detailed description of the proposed project
- Chapter (5): Environmental impacts and procedures for mitigating the implications of the proposed project
- Chapter (6): Analysis of Project alternatives
- Chapter (7): Environmental management plan and environmental monitoring
- Chapter (8): Emergency plan and occupational safety and health procedures

2. Laws and Legislation

First: Law No. 15 of 5895 Regulating Medical Facilities

Article 1: In the application of the provisions of this Law, a medical facility is deemed every place prepared for the examination, treatment, or nursing of patients or accommodation of recovering patients or medical examinations, and includes the following:

(A) Private Clinic:

It is every facility that a physician or dentist owns, lease, or be assigned the right to legally use it and is managed by a physician or dentist, each according to its licensed profession, and no other rules prevent him/her from this practice, and it is intended to receive and care for patients medically and it is permissible to have beds for observation and not to reside therein, provided that it does not exceed three beds. A physician or dentist or more who are licensed to practice the profession of the same specialty may assist or act in the place of the physician or dentist in the event of his/her absence.

The radiology clinic and laboratory that is owned or managed by a physician is considered as a private clinic.

(B) Specialized Clinic

Every facility that is owned, leased, or the legal right of which is transferred to a physician or more who are licensed to practice the profession and is designed to receive and medically care for patients. It is permissible to contain beds in which the number does not exceed five beds. More than one physician work in specialized clinics from different specialties brought together by a joint management, and one of whom is the technical director in charge of the clinics.

Minor surgeries may be performed only in an operating room equipped in accordance with the regulations governing the same.

It is also permissible to authorize the establishment of specialized clinics for an association registered with the Ministry of Social Affairs or a public authority whose purposes include establishing and managing these specialized clinics or a company for treating its employees or residents of its facilities, and these clinics are subject to the provisions of the two preceding paragraphs hereof.

(C) Specialized Medical Center:

Every facility that is owned, leased, or the legal right of which is transferred to a physician or more who are licensed to practice the profession and is designed to receive

and medically care for patients. Work in the center is limited to one specialization with its subtle branches and related complementary specialties, and they are joined by a joint management, one of whom is the technical director in charge, and it is permissible that it has beds that do not exceed twenty-five beds, and surgeries may be performed in it in a large operating room equipped in accordance with the regulations governing the same.

(D) Private Hospital:

It is every facility prepared for the reception and examination of patients, and there are at least fifteen beds, and it is also necessary to have at least two operating rooms, a recovery room, and another intensive care room, and it shall be equipped according to the regulations governing the same.

/Missing texts/

Still studying at the Faculty at the end of the period and the necessary lead time has been granted until he/she graduates in order to transfer the license to him/her.

However, if the period has elapsed without having a physician or a student in a medical faculty who is among the sons of the facility's owner, the heirs must dispose of it to a physician licensed to practice the profession before the end of the period, however it shall be disposed of by the competent administrative authority granting the license.

Article 5 The lease agreement of the medical facility does not end with the death of the tenant or leaving the premises and will continue for the benefit of the heirs and partners to use the premises as the case may be, and the deceased and its heirs may assign it to a licensed physician, and its heirs may assign it to a physician licensed to practice the profession. In all cases, the lessor shall issue a lease agreement for those who have the right to continue occupying the premises.

Article 6 A physician may own more than one private clinic, but he/she may not operate more than one medical facility other than private clinics.

Article 7 The medical facility must fulfill the health and medical requirements issued by a decision from the Minister of Health, and include everything that is related to equipment and the method to perform the medical service, taking into account the fulfillment of the conditions and specifications of the operating room in the event of surgery, without prejudice to the provisions of Law No. 59 of 196 concerning the Regulation of work with ionizing radiation and protection from its dangers, and in the case of an X-ray machine.

This as well is without prejudice to Law No. 367 of 1954 on the Regulation of the Profession of Medicinal Chemistry, Bacteriology, and Pathology, and the Regulation of medical diagnostic laboratories, scientific research laboratories, and biological preparations laboratories.

Article 8 The physician who works in a medical facility must meet the following conditions:

1. He/ she must be an Egyptian.
2. He/ she must be registered in the Medical Syndicate.

However, non-Egyptians may work in the aforementioned facility in the following two cases:

A. Non-Egyptian physicians who are permitted by the Medical Syndicate to register in its records. Reciprocity of treatment and the approval of the competent authorities are required.

B. The license for foreign experts whose type of expertise is not available in Egypt or the expertise required by the nature of the practice of the profession, and in this case a prior approval must be obtained from the Minister of Health and the Medical Syndicate Council, and the license to practice the profession for a period does not exceed three months, and it is recorded in a special record for the Medical Syndicate after paying the prescribed fees.

In all cases, the salaries, wages and privileges granted to Egyptian physicians must not be less than what is granted for their colleagues of foreign physicians working in the facility.

Article 9 Under a resolution by the Minister of Health, the percentage of the number of resident physicians, nursing staff, and technicians to be available in each medical facility is determined proportionally to the number of beds allocated for inpatient treatment, provided that they are licensed to practice the profession.

Article 10 Every medical facility shall adhere to a by-law of ethics for the medical professions in all its acts, especially in the means of publicity and advertising, so that the facility is not advertised after obtaining the approval of the Ministry of Health and that the advertisement does not include methods of diagnosis or treatment, and the approval of the Syndicate is required if the physician wants to advertise himself/herself or his/her activity.

Article 11 The medical facility must be inspected at least once a year to verify the fulfillment of the requirements stipulated in this Law and the decisions in implementation hereof. If the inspection reveals any violation, the facility manager shall be informed of it to be removed within a grace period of thirty days, and in the case of grave violations, the competent governor may, based on a proposal from the competent authorities, order the closure of the relevant facility, and it is not permissible to cancel its closure except after verifying that the reasons for the closure have ceased.

Article 12 Under a resolution by the Minister of Health, a committee is formed, in which the presidency of physicians, the Ministry of Health, and a representative of the owners of medical facilities are represented. The committee stipulated in the previous

paragraph shall be competent to determine the fees for accommodation and the services provided by the facility.

In this determination, a decision shall be issued by the competent governor, taking into account the cost elements that were approved upon licensing.

The medical facility shall announce its price list in a visible place, and notify the Medical Syndicate and the competent Health Affairs Directorate of these prices to register them with it.

Article 13 The license in the medical facility shall be revoked in the following cases:

1. If the licensee requests its cancellation, or if work has been suspended in the facility for a period of more than one year, and in the case of private clinics, the license shall be suspended in the event that the licensee is absent for more than one year, and it shall continue after his/her return, and he/she shall notify the sub-syndicate and the competent department of the Directorate of Health Affairs in both cases.
2. If the facility was moved from its place to another place or was rebuilt.
3. If an amendment is made in the facility that violates the provisions of this Law or the decisions in implementation hereof and the situation does not return to what it was before the amendment within the period specified by the competent authority.
4. If the facility is managed for a purpose other than the purpose for which the license was granted.
5. If a judgment is issued to close the facility permanently or to de-register it.
6. If the violation is repeated by the facility despite the imposition of the penalties prescribed by the law and the facility has not been deterred from the violation.
7. If the medical facility is practiced by persons who do not have a license to practice the profession of medicine, as well as the other medical professions.

Article 14 Whoever operates a medical facility of which closure has been previously issued or an administrative decision has been issued to close it before the reasons for closure ceases to exist shall be punishable by imprisonment for a period not exceeding one year and a fine of not less than ten thousand pounds and not exceeding twenty thousand or one of these two penalties.

Article 15 Whoever obtains a license to open a private medical facility by circumvention or by borrowing the name of a physician for this purpose shall be punished with

imprisonment for a period not exceeding two years and a fine of not less than twenty thousand pounds or one of these two penalties, and the same penalty shall be imposed on the physician who lends his/her name to obtain the license in addition to the judgment to close the facility, subject of the violation, and revoke the license granted to it, and the judge may order the immediate implementation of the closure judgment, even with the existence of opposition or appeal to it.

In all cases, the closure judgment shall be enforced, and the petition of the owner of the facility or third parties to the implementation shall not be taken into consideration, without prejudice to the application of any more severe penalty stipulated in another law.

Article 16 Any other violation of the provisions of this Law shall be punished by a fine of not less than two thousand pounds and not more than twenty thousand pounds. In the event that the violation is known to have not ceased within the period granted for that, the judge may rule upon the request of the competent health authority to close the facility permanently or for the period specified by the judgment, and the judgment shall be executed immediately, even with opposition or appeal to it. The closure judgment shall be executed without regard for the other activities that may be practiced in it, when the status of the facility does not allow the closure to be limited to the part in which the violation occurred.

Article 16 bis Taking into account the provision of Article (14) of this Law, if the facility conducts its activities before obtaining the license, it will be closed by a decision of the competent health authority directly, and the judge may rule at its request to impose a fine of not less than one thousand pounds and not more than fifty thousand pounds for the violating facility, and the activity is not practiced until after obtaining the license.

In the event that the hospital repeatedly commits professional violations, it may be placed directly under the Ministry's supervision.

Article 17 The physicians working in the Central Administration of the Non-Governmental Therapeutic Institutions and Licenses, the directorates of health affairs in the governorates, health departments and free treatment in them, as well as directors of dental departments and those appointed by the Minister of Health in agreement with the Minister of Justice among the full-time physician shall have the capacity of judicial arrest officers for crimes that occur in violation to the provisions of this Law or the decisions in implementation thereto, and for this purpose they and their companions have the right to enter the medical facility and inspect it at any time.

Article 18 Licenses previously issued to medical facilities prior to enforcing this Law shall continue to apply, provided that their conditions are adjusted in accordance with the provisions of this Law within two years from the date of its enforcement.

Second: Solid waste

An amount of solid waste results from operating the hospital, and the following Article stipulate the following provisions:

Article 37 of Law 9/2009 amending Law 4/1994:

Article 37 states that it is prohibited to dump or burn solid waste except in specialized places away from industrial, residential, agricultural and waterways areas, and the executive regulations of this law determine the specifications, controls, and minimum distances for places designated for these purposes from those areas, and the local administration units shall be bound by an agreement with EEA to allocate places for dumping, sorting and treatment of garbage and solid waste in accordance with the provisions of this law and its implementing regulations, and these units shall also allocate bins or places within cities and villages for the collection and transportation of garbage and solid waste and to set the appropriate dates for that, otherwise the competent administrative official must be held accountable.

It is also prohibited to throw garbage and solid waste in other than those bins and places designated for them. Those responsible for collecting and transporting garbage and solid waste are obligated to observe the cleanliness of their collection bins and transport vehicles, and that the bins are tightly covered, and the collection and transportation of the garbage and solid waste is in appropriate periods, and it not exceed the quantity of its true capacity in any of those bins.

Article 38 of the amended executive regulations, and Resolution No. 1741/2005:

The open burning of garbage and non-hazardous solid waste is strictly prohibited, and it is prohibited to throw or treat garbage and solid waste except in designated places away from industrial, residential, agricultural and waterways.

Article 39 of the amended executive regulations, and Resolution No. 1741/2005:

Collectors of garbage and solid waste shall take into account the cleanliness of garbage collection bins and cars, and that the condition of continuous cleanliness is one of the established conditions for safety, durability and means of transporting garbage.

The following table (Table 1) presents the specifications for solid waste management in the executive regulations of Law No. 38 of 1967 issued by Minister of Housing Resolution No. 134/1968.

Table (10) Specifications for solid waste management under Law No. 38 of 1968

Component	Material	Specification
Storing containers	6	<ul style="list-style-type: none"> • The appropriate capacity of the resulting waste • Solid metal or similar material that is free of holes • The local authority may provide detailed specifications or model names • Containers should be kept inside the buildings they serve, except for times of garbage collection • The containers must be kept clean and washed after each use
Contractor's obligations	7	<ul style="list-style-type: none"> • Provide means of collecting and transporting garbage and wastes to the places specified by the competent authority • Dispose of them according to the stipulated requirements and specifications
Contractor's liabilities	8	<ul style="list-style-type: none"> • Responsible before the competent authority of general cleaning work for its garbage collectors • Responsible for the means of transport used and everything related to this process
Collection times	11	<ul style="list-style-type: none"> • The local council determines the periods and dates for the collection of waste according to local conditions

A. Laws and legislation related to hazardous materials and waste

The hospital will use some hazardous materials during work, so we review the following laws on how to handle hazardous materials and hazardous waste such as medical waste will be generated.

Article (26) of the executive regulations amended by Resolution No. 1095/2011

Article (26) stipulates that the applicant for a license to handle hazardous materials and wastes must submit its application in writing to the competent authority stipulated in Article (25) of these regulations, fulfilling the information specified by the authority in accordance with the form prepared for this purpose.

The license for handling hazardous materials and waste is issued for a period of five years as a maximum, unless something that requires reviewing the license occurs, and the competent administrative authority, according to what is stipulated in Article (40) of these regulations, may grant temporary licenses for short periods, as required.

Licensing procedures:

The application for obtaining a license to handle hazardous materials must fulfill the following information:

- The entity in charge of handling hazardous materials and waste.
- The producer of hazardous materials and waste.
- A complete description of the hazardous materials and wastes to be handled and the nature and concentration of the hazardous elements in them.
- Determination of the hazardous materials and waste amount to be handled annually and description of the method of their packaging (drums - tanks - bulk).
- A description of the means to be used to store hazardous materials and wastes and the storage period for each of them, with an undertaking to write a clear statement on the package to inform about its content, extent of its danger, and how to act in case of emergency.
- Clarification of the means to be used in transportation (land - railways - sea - air - inland waters) and determining their routes and timing.
- A comprehensive description of the method to be followed in the processing and disposal of hazardous materials and wastes for which a license is required to be handled.

- An undertaking not to mix hazardous materials and wastes with all other types of non-hazardous wastes that are generated from social and productive activities.
- An undertaking to keep records to ensure a complete statement of the quantities and qualities of hazardous materials and wastes, their types, sources, equipment, and the periods of their collection and storage, the method of transporting and processing them, while providing these data upon each request, and not to amortize or destroy these records before five years from the date of their commencement of use.
- An undertaking to take all measures to ensure the safety of hazardous materials and waste packaging during the stages of collection, transportation and storage.
- Developing and presenting an emergency plan to confront all unforeseen circumstances in a manner that guarantees environmental protection and public health.
- Certificate of previous experience in handling hazardous materials and waste.
- Acknowledgment of the correctness of the data contained in the license application.

The following conditions are required for granting the license:

- The application for obtaining a license to handle hazardous materials and waste must be complete with the following information:
 - Availability of trained personnel responsible for handling hazardous materials and waste.
 - Availability of the necessary means, capabilities and systems for the safe handling of these materials and wastes.
 - Fulfillment of requirements to face the risks that may result from accidents during handling.
 - The activity to be licensed does not result in harmful effects on the environment and public health.

Article (27) of the executive regulations amended by Resolution No. 1741/2005

It stipulates that the issuance of the license for the handling of hazardous materials and waste is made for charge to be determined by a decision of the competent minister, and the license is valid for a maximum period of five years, subject to renewal.

The licensing authority may cancel it or suspend the activity by a reasoned decision in the following cases:

- If the license was issued as a result of providing incorrect data.
- If the licensee violates the terms of the license.

- If the practice of the activity resulted in serious environmental impacts that were not foreseen when the license was issued.
- If advanced technology was developed, it can be applied with simple modifications, and its use leads to a significant improvement in the environmental condition and the health of workers.
- If the opinion of EAA concludes that handling any of these materials and wastes is unsafe.

The licensing authority may ask the license applicant to fulfill other conditions it deems necessary to secure this handling in coordination with EAA and the Ministry of Health. In all cases, the license applicant may not handle hazardous materials and wastes before obtaining the license written on the form prepared for this purpose and it must be kept with the handler to provide it upon request.

Article 28 of the executive regulations amended by Resolution No. 1741/2005:

Hazardous waste management is subject to the following rules and procedures:

First: Hazardous waste generation stage:

The entity that generates hazardous waste shall conduct the following:

- Work to reduce the rate of generating these wastes, in quantity and quality, by developing the technology used, adopting clean technology, and choosing alternatives to the product or raw materials that are less harmful to the environment and public health.
- Description and record of the generated waste, in terms of quantity and quality.
- Establishing and operating waste handling units at the source, provided that EAA approves the method of handling, the technical specifications of these units and their operating programs.

When it is not possible to handle or dispose of the hazardous waste at its source of generation, the party in which this waste is generated is obligated to collect it and transport it to the disposal places prepared for that and which are determined by the local authorities, the competent administrative authorities and EAA, and all the terms and conditions for this as mentioned in these regulations shall apply to the handling of these wastes.

Second: The stage of collecting and storing hazardous waste

- Setting specific areas for storing hazardous waste, marked with clear warning signs, and having safety conditions that prevent any harm to the public or to those who are exposed to it.

- Storing hazardous waste in special containers made of a solid material and free of holes from which liquids do not leak and provided with a tight cover and its capacity is proportional to the amount of hazardous waste, or according to the principles of storing such waste according to its type.
- Hazardous waste storage containers are clearly marked to inform of their contents and the dangers that may result from improper handling.
- A schedule is set for the collection of hazardous waste so that it is not left for a long time in storage containers.
- The generator of hazardous waste must provide the previous containers and take into account washing them after each use and not placing them in public places.

Third: The stage of hazardous waste transportation

It is prohibited to transport hazardous waste in other than the means of transport of the entities licensed to manage hazardous waste, and these means must meet the following requirements:

- Transport vehicles must be equipped with all safety means and in good working condition.
- The capacity and number of transport vehicles must be suitable for the quantities of hazardous waste.
- Vehicles must be clearly marked to determine the severity of their cargo and the best way to act in the event of an emergency.

Article (29) of the Executive Regulations of Law 9/2009 amended by Resolution No. 710/2012 (Executive Regulations amended by Resolution No. 1741/2005)

Article (29) states that it is prohibited to handle hazardous materials and wastes without a license issued by the competent authority indicated next to each of these materials and wastes. The executive regulations of this law indicate the procedures and conditions for granting the license and the authority competent to issue it.

It also provides for the prohibition of establishing any facilities for the purpose of handling hazardous waste except under a license from the competent governorate after consulting EAA, the Ministry of Health, the Ministry of Manpower and the ministry concerned with the type of waste in accordance with what is stipulated in Article (25) of these regulations in a manner that ensures that the facility meets all the conditions that includes the safety of the environment and its workers.

Moreover, the disposal of hazardous wastes shall be in accordance with the conditions and standards stipulated in Article No. (28) of this regulation.

The Minister of Housing, after consulting the competent ministry, the Ministry of Health and EAA, determines the areas and conditions for licensing the disposal of hazardous waste.

B. Legislation related to the EIA study

According to Environmental Law No. 4 of 1994 aa amended by Law No. 9 of 2009 and its executive regulations amended in 2005, the project owner must conduct an EIA attached to the license application for the new project and/or expansions of existing facilities. Accordingly, environmental requirements are included in the current licensing system.

The EIA guidelines (EEAA, 1996) are classified for development projects into three categories according to the severity of their potential impact on the environment. These categories reflect the increasing levels of EIA and include the following:

Category (A): Projects with a slight impact on the environment.

Category (B): Projects with an impact on the environment that must be taken into account.

Category (C): Projects with high potential impacts that require a full environmental assessment study.

Based on the foregoing, the project in this study has been classified within the projects of list (B specific), after consulting the central administration to assess the environmental impact. According to Law 4/1994 aa amended by Law No. 9 of 2009 and its executive regulations, the EIA study is submitted to the competent administrative authority in which the project falls within the scope of its specialization. The competent administrative authority or the licensing authority sends the EIA study to EAA to express an opinion. EAA must provide the competent administrative authority or the licensing authority with its opinion on this evaluation within a maximum period of 30 days from the date of receiving the study and that is in accordance with the amendment by Law No. 9 of 2009. In the event of no response during this period, the study is considered approved. In the event of rejection, the project owner has the right to file a complaint within 30 days of receiving the rejection decision.

The competent administrative authority informs the project owner of the assessment result by registered letter with acknowledgment of receipt, and the owner may object in writing to this result within thirty days from the date of notification before a committee formed by a decision of the competent minister or the licensing authority.

Articles relevant to conducting EIA studies in general:

Article 19 of the Environmental Law 4/1994, as amended by Law 9/2009

Every natural or legal person, public or private, shall submit an environmental impact assessment study for the facility or project to the competent administrative authority or the licensing authority before starting the implementation of the project, and the study is conducted according to the elements, designs, specifications, foundations and specific loads issued by EAA in coordination with the administrative authorities. The competent administrative authorities are obligated to provide maps of industrial zones indicating the types of industries permitted according to environmental loads. The executive regulations of this law determine the establishments and projects to which the provisions of this article apply.

Article (20) of the Environment Law 4/1994, as amended by Law 9/2009

The competent administrative authorities or the licensing authority shall send the completed EIA studies referred to in the previous article to EAA to express its opinion on this matter. EAA may submit proposals to the study provider in the fields of equipment and systems needed to deal with the negative environmental impacts, and it is asked to implement them. EAA may request the study provider to complete any data, designs, or clarifications that are necessary to express an opinion on the study, and EAA must provide the competent administrative authority or the licensing authority with its opinion issued regarding this assessment within a maximum period of thirty days from the date of receiving or completing the study. Otherwise, non-response shall be considered an approval of the assessment, and the project must start its activity during the period of the license granted to it to start practicing the activity, or the environmental approval shall be deemed null and void.

Article 21 of the Environmental Law 4/1994, as amended by Law 9/2009

The competent administrative authority shall inform the owner of the facility of the assessment result by a registered letter with acknowledgment of receipt, and the owner may object in writing to this result within thirty days from the date of its notification before a committee formed by a decision of the competent minister of environmental affairs, and in this committee EAA, the owner of the facility, and the competent authority or the licensing authority are represented in this committee. The executive regulations shall specify the competencies of this committee, the procedures for objection, and the procedures for its work.

Article 14 of the executive regulations

The competent administrative authority shall inform the owner of the facility of the assessment result by a registered letter with acknowledgment of receipt, and the owner may object in writing to this result within thirty days from the date of its notification to the permanent committee for review, of which formation is made by a decision by the competent minister of environmental affairs headed by a consultant from the Council of State and the following members:

- A representative of the EAA nominated by the EAA CEO.
- The owner of the facility or its representative under an official power of attorney
- A representative of the competent authority or the licensing authority if it is not the competent authority.
- Three experts to be selected for the membership of the committee based on the nomination of the CEO of EAA.
- The committee may form from among its members and others sub-committees to study the objections referred to it and submit its report to the committee, and it also has the right to seek the assistance of whomever it deems appropriate when carrying out its duties. Also, the committee must issue its decision within sixty days from the date on which the objection papers are received in full.

Article 15 of the executive regulations

The permanent committee of review stipulated in Article (14) of these regulations shall be responsible for considering the objections presented or referred to it regarding the assessment result or the proposals requested to be implemented by EAA and decide its opinion on these objections with regard to the controls stipulated in Article (10) hereof. The objection shall be submitted to EAA in writing, fulfilling the reasons for the objection and the legal and scientific grounds on which the project owner relies, and the objection shall be accompanied by whatever documents the owner deems appropriate to support its objections.

C. Materials related to the project's activity

Environmental Record

Article (20) of the Law

The existing environmental monitoring networks with their stations shall be work units affiliate to the competent authorities from the administrative aspect, and this includes continuous self-monitoring units in the various establishments, and, within

their field of competence, they monitor the components and pollutants of the environment periodically and make data available to the concerned authorities in the form and manner required by those authorities.

For this purpose, it may seek the assistance of research centers, authorities and the competent bodies, and these centers, authorities and bodies must provide it with the studies and data it requires.

The EAA shall supervise the establishment and operation of environmental monitoring networks in preparation for the establishment of a national program for environmental meteorology.

Article 22 of the Law

The official responsible for managing the facility in accordance with the provisions of this law shall keep a record of the effect of the establishment's activity on the environment (an environmental record).

The executive regulations shall set a model for this record and the schedule required to be retained by the facilities, and the data that are recorded in it. EAA shall be responsible for following up the record data to ensure their conformity with reality, take the necessary samples and conduct appropriate tests to demonstrate the impact of the facility activity on the environment, and to determine the extent of its compliance with the standards set for environmental protection, or the specific loads of pollutants, and if it becomes evident that the facility does not maintain the environmental record, or its data is irregularly recorded, does not match the facts, or the facility does not adhere to the standards or loads referred to, or any other violation of the provisions of this article, EAA shall notify the competent administrative authority to assign the owner of the facility to urgently rectify infringement. If the owner does not do so within 60 days from the date of the assignment, EAA, after notifying the competent administrative authority, may take any of the following procedures:

- Granting a specific additional period for the facility to correct the violations, and EAA has the right to do so at the facility's expense.
- Stopping the violating activity until the impacts of the violation are removed and without prejudice to the wages of its workers.

In the event of a serious environmental hazard, its sources must be stopped immediately, by taking all necessary means and measures.

Article 17 of the executive regulations

The owner of the facility, in accordance with the provisions of these regulations, shall keep a record to demonstrate the impact of the facility activity on the environment, in which the following data are recorded:

- Emissions discharged or disposed of and their loads.
- Specifications of the output after the processing process and the efficiency of the processing units used.
- Follow-up, safety and environmental self-monitoring procedures applied in the facility.
- Periodic tests and measurements, the number of samples, the timing and place of their withdrawal, taking measurements, and conducting measurement and analysis and its results.
- The official in charge of follow-up.
- The record shall be prepared according to the form shown in Annex No. (3) to these regulations.

The owner of the facility or its representative shall immediately notify EAA, by a registered letter with the acknowledgment of receipt, of any deviations in the standards, specifications, and loads of the emitted or discharged pollutants and the measures taken for correction.

Article 35 of the Law

Facilities subject to the provisions of this law shall, in carrying out their activities, not emit or leak air pollutants in excess of the maximum limits permitted in the applicable laws and decisions and what is specified by the executive regulations of this law.

Wastewater Quality

The public water network in Cairo Governorate is the main source of water. Water is used for human consumption. The following table (Table 2) clarifies the drainage standards on the public network according to Law No. 93 of 1962.

Table 2: Maximum limits for the drainage standards on the public drainage network according to Law No. 93 of 1962.

Drainage Indicators	Max. Limits
----------------------------	--------------------

Temperature	43 °C
PH	6- 9
Absorbed bio-oxygen	600 ppm
Consumed chemical oxygen	1100 ppm
Oils and greases	100 ppm
Suspended aggregate materials	800 ppm
Sulphides	10 ppm
Total nitrogen	100 ppm
Total phosphates	25 ppm
Cadium	0.2 ppm
Copper	1.5 ppm
Heavy macro metals	5

Air Quality

Article 36 of Law 4/1994 and Article 37 of its amended regulations clarify the maximum permissible limits for exhaust gases resulting from the operation of machines, engines and vehicles.

Article 35 of Law 4/1994 and Article 34 of its amended executive regulations set out the maximum permissible limits for outdoor air pollutants.

The following table (Table 3) presents the maximum permissible limits for outdoor air emissions and diffusion according to Law No. 4 of 1994 and amendments to Law No. 9 of 2009 (Annex No. 5 issued in 2012)

Table 3: Maximum limits for outdoor air pollutants

Pollutant	Area	Max. Concentration Micrograms/ m ³			
		1 hour	8 hours	24 hours	1 year
Sulfur dioxide	Urban area	300		125	50
	Industrial area	350		150	60
Carbon Monoxide	Urban area	30 mg/ m ³	10	-	-
	Industrial area				
Nitrogen dioxide	Urban area	300	-	150	60
	Industrial area	300		150	80
Ozone	Urban area	180	120	-	-
	Industrial area	180	120		

Total suspended solid particles	Urban area Industrial area	-	-	230 230	125 125
Solid particles less than 10 µm	Urban area Industrial area			150 150	70 70
Solid particles less than 2.5 µm	Urban area Industrial area			80 80	50 50
Solid particles measured as smoke	Urban area Industrial area			150 150	60 60
Lead	Urban area Industrial area			-	0.5 1
Ammonia	Urban area Industrial area			120 120	-

Work environment

According to Articles 43 and 45 of Law 4/1994 and Articles 44, 45, 46 and 47 of its executive regulations as amended by Resolution No. 1095 of 2011, the project owners shall provide workers with protection devices and all necessary safety procedures to protect them from noise, heat stress and gaseous emissions in the work environment.

The owner of the facility shall take the necessary precautions and measures to protect workers from the dangers of exposure to chemicals used or resulting from industrial processes or that leak inside the workplace (such as gases, vapors, and dusts) so that they do not exceed the permissible limits indicated in the chemical materials identification cards. The facility owner must keep the identification cards in a special file and ensure that warning signs and hazard symbols are placed on all chemicals used, and it must implement ventilation procedures that ensure air purification and reduce emissions, all in accordance with what is indicated in Annex No. (8) attached to this regulation.

The owner of the facility shall also take the necessary measures to maintain the temperature and humidity levels within the workplace in a manner that does not exceed the permissible limits as mentioned in Table No. (1 of Annex No. 9) attached to this regulation, and in the case of the need to work under heat stress (temperatures or relative humidity or heat radiation) that is higher or lower than the permissible limit, measures must be taken to ensure the protection of workers, their adaptation, and their submission to continuous medical supervision, in accordance with what is included in Annex No. (9) attached to this regulation.

Articles 208 to 215 in Section (3) of Chapter (5) of Labor Law No. 12/2003, tackle the facility's responsibility to protect workers from risks arising from the use of solid, liquid and gaseous chemicals. Ministerial Law No. 134/2003 obliges facilities with more than 50 workers to establish a safety and security committee for workers. This committee is responsible for the safety of the workplace and its workers, as well as providing monitoring and measuring pollution tools and devices within the work environment. In addition, Ministerial Resolution No. 211/2003 issued by the Ministry of Manpower sets out requirements that prevent any physical, chemical, mechanical and biological hazards from occurring in the workplace.

Noise

Article 42 of Law 4/1994 and Article 44 of its amended executive regulations tackle the maximum limits of loudness. Article 44 stipulates that all authorities and individuals, when conducting production, service or other activities, especially when operating machinery, equipment, loudspeakers and alarm devices, shall not exceed the permissible limits of the "volume level" and the duration of the time to be exposed to it inside workplaces and public places. The licensing authorities should take into account that the total number of sounds emitted from fixed and mobile sources in one area are within the permissible limits, and ensure the facility's commitment to choosing the appropriate machinery and equipment to ensure the same.

The following table shows the maximum limits for the volume levels from different activities and the exposure period in case the noise exceeds 90 dB.

Table 4: The maximum volume levels of the various activities according to Table (1) of Annex (7) of the executive regulations

Type of Place / Activity	Max. volume limit (dB)
Workplaces with a shift of up to 8 hours in order to reduce the risk of noise on the sense of hearing	90
Workplaces that require hearing audible signals and good hearing of speech	80
Work rooms for computers or typewriters and the like	70
Work rooms to monitor, measure and control operation	65
Work rooms for activities requiring routine mindfulness and control rooms	60

3. Full description of the field hospital

First: Hospital Location

The hospital is located in the southeastern part of the university campus in Abbasiya in internal streets between Ain Shams Specialized Hospital and the Guest House, Faculty of Dentistry and Faculty of Pharmacy on two opposite plots of land (as shown in the attached figures Nos. (1 - 3).

The first plot: (Plot A) on the borders of Ain Shams Specialized Hospital with an area of about 3200 m².

The second plot: (Plot B) on the borders of the Guest House and the Faculty of Pharmacy, with an area of about 1,400 m².

Second: Hospital Design

Figures 4 and 5 illustrate the general scheme for the Hospital. Cases are reserved in 2 tents with a capacity of (176) beds (165) inpatient beds and (11) intensive care beds. The Field Hospital is divided into the following:

1. A contaminated area for patients, which is in the middle corridor and the places of inpatient and intensive care beds
2. A clean area for health service providers, which is the external corridors and areas of the Field Hospital, through which health service providers enter places to wear personal shields before entering the patient's areas.

A barrier separates the two areas so that there is no mixing occurs and contamination is prevented.

Work Method Inside the Hospital

1. Patient admission: For carriers of the virus including
 - Patients and employees of Ain Shams University Hospitals
 - Ministry of Health (by Dr. Mohamed Hassani)
2. The Hospital Manager in which the patient is located informs the management of Ain Shams University Field Hospital (the manager or his/her deputy) of the pathological condition and sends a medical report of its current status and coordinates the appointment of the hospital's reception.
3. Cases are received through Gate (1) and the necessary examination is made for them and they are divided into one of the following paths:
 - Critical positive cases path: Patients are kept in the Intensive Care Department, with a capacity of (11) beds.
 - Medium positive cases path: Patients are kept in the inpatient beds.

Patients transferred from the Ministry of Health:

- Sending lists of patients' names, ages, and pathological status before sending them to the Field Hospital, so that they can be accommodated in the beds before arriving on the bed map.
 - Sending patients in groups with a limited number of patients arriving each time, up to a maximum of 10 patients.
4. The patient is transferred to his/her bed through the middle corridor and enters his/her own bed.
 5. The admission and registration procedures are completed at the administrative office (with a special record) and a wristband is made for the patient mentioning patient's number.
 6. Patients are sent to their beds.



Figure (1) Location of Ain Shams University Field Hospital





Figure (2) A satellite image for the Field Hospital



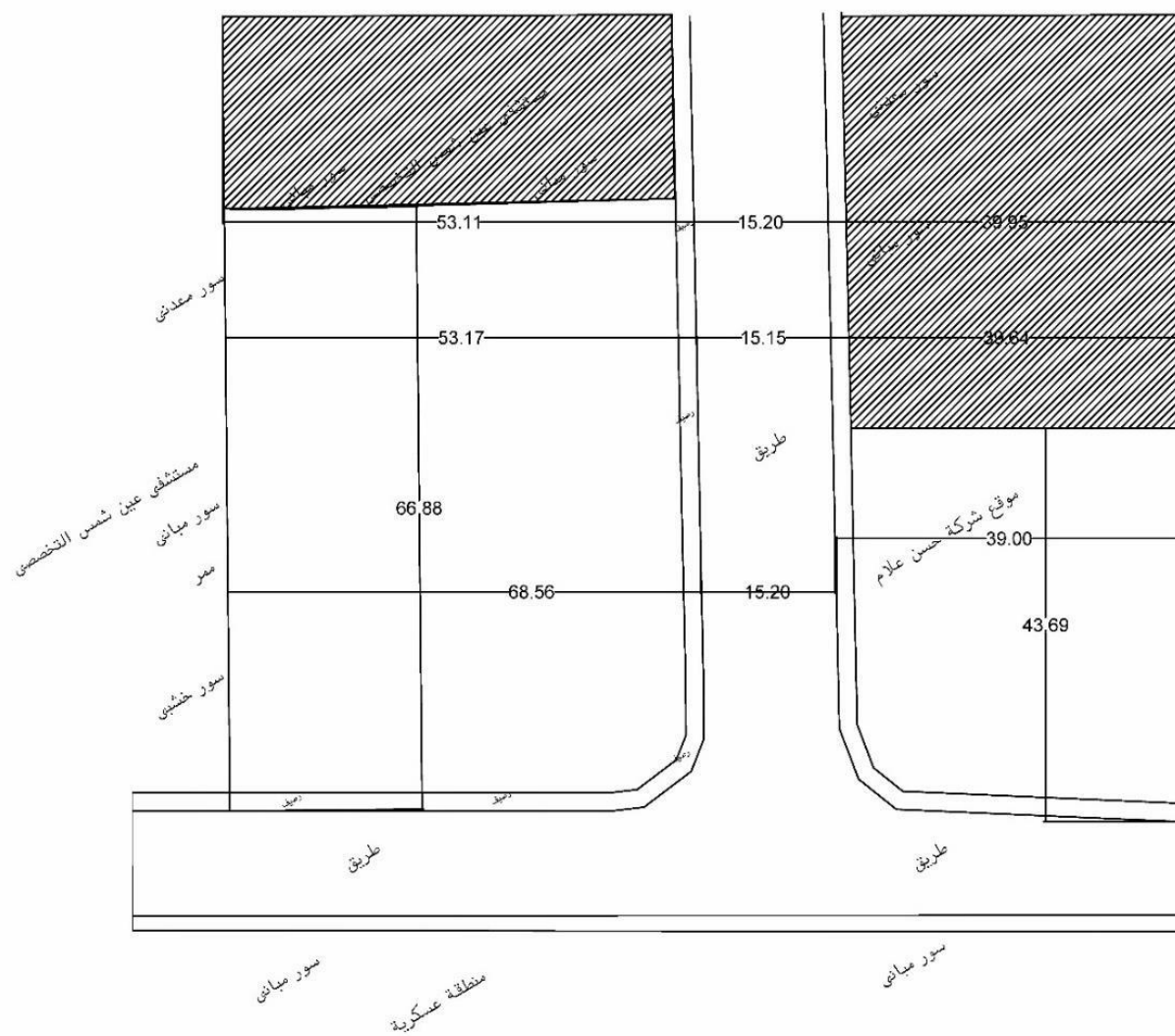


Figure (3) The Field Hospital Scheme



Figure (5) Image of the Hospital Site



Third: the engineering systems used to equip the Field Hospital (Figure 6)

1. A layer of soil replacement, leveling and equipping of the grounds with heavy equipment compaction was implemented at zero level.
2. Sewage and supply networks and electrical networks are executed within plastic pipes, whether inside concrete or ducts between concrete.
3. 25 cm of reinforced concrete was poured for the concrete floor with leveling and smoothing the surface.
4. Drinking water tanks with a capacity of (60) m³ have been implemented.
5. Waste water collection tanks were made with a storage capacity of 35 m³, with the installation of submersible pumps with a grinder in each tank at a discharge level of 5 liters per second to raise water to the public network. (Figure 7)
6. A sodium hypochlorite injection station was implemented to inject water before it is discharged to the network.
7. The Hospital's steel frame (aluminum) is of distances between columns equal to 5 meters, fixed to the floor by strings.
8. The metal frame is covered with Teflon cladding that resists fire, wind and rain.
9. The technique of internal partitions for the walls of rooms, laboratories and bathrooms is made from corrugated iron sheets that are foam injected.
10. The floors are covered with vinyl that resists bacteria and is ready for electrostatic charges leakage.
11. There is an oxygen station connected to a piping network inside the Hospital connected to supply units next to each bed, a group of mobile suction units and air cylinders. The Hospital contains medical oxygen tanks, which are pressurized tanks at 16 bars higher than the atmospheric pressure in order not to allow air and moisture to enter it, and there is no type of waste or environmental damage in them. As for the medical air cylinders, they are pressed at 200 bar, which is a mixture of oxygen and nitrogen that form the air ratio as shown in Figure (8).
12. Separate, vertical air-conditioners were used, in addition to the presence of fans for air intake from inside the tents, which have HEPA filters installed.
13. The source of electricity supply from the power station of the Faculty of Pharmacy, which is equipped with two electricity sources in addition to an emergency generator.
14. The Hospital is equipped with emergency batteries for vital devices UPS with a capacity of 40 kV per unit.

15. Electricity supply units were used among the beds to provide each bed with an adequate number of electrical outlets.

16. LED lights were installed on the roof of the Hospital.

17. A fire-fighting truck will be provided by the Civil Protection on an ongoing basis (24/7).

18. Two civil protection personnel will be provided to hospitals on an ongoing basis (24/7), while equipping the Hospital with a sufficient number of mobile fire extinguishers.

Figures Nos. (9) and (10) illustrate the Hospital's internal equipment.

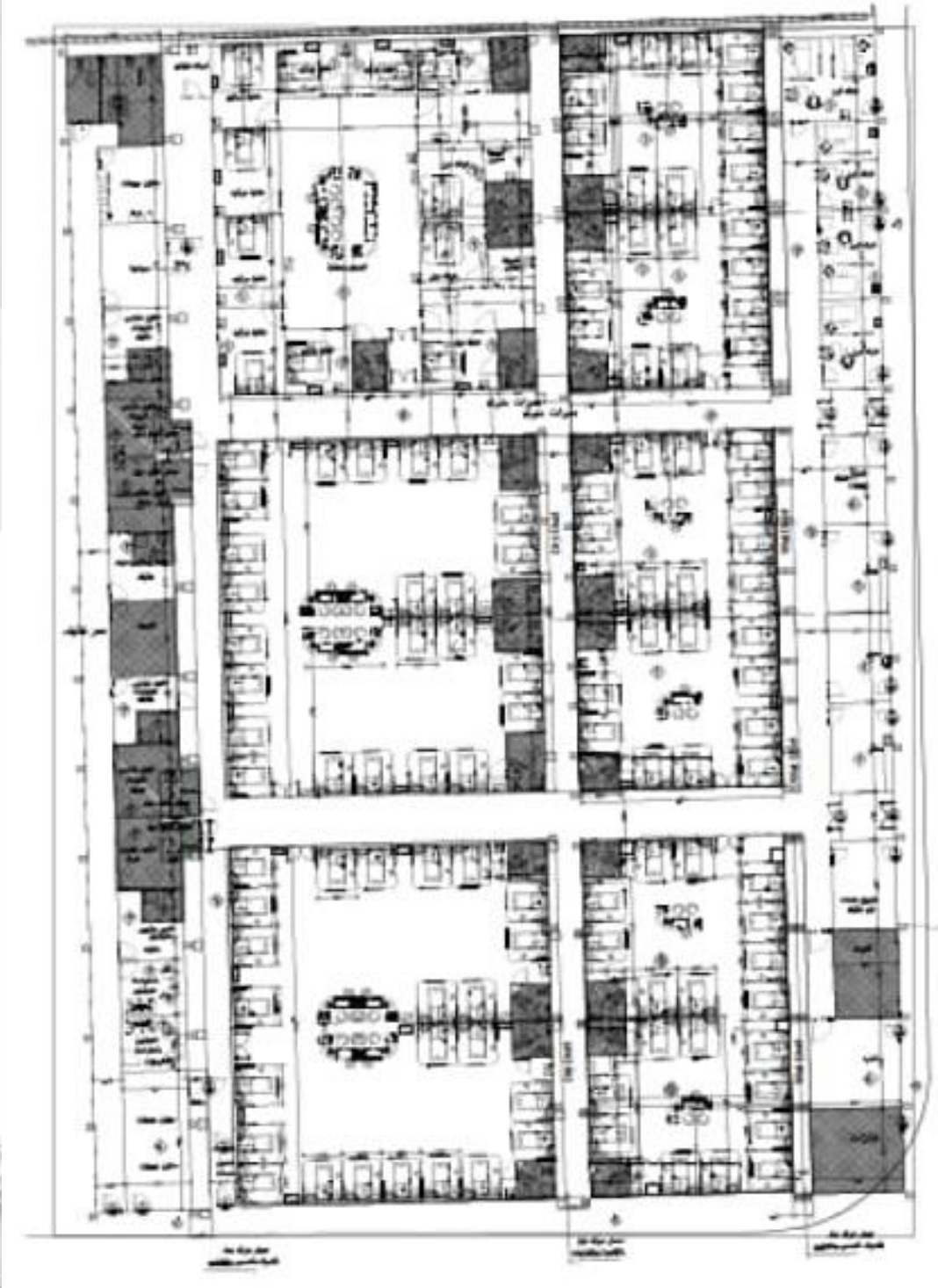


Figure (6) Engineering Design of the Field Hospital



Figure (7) Oxygen Cylinders in the Field Hospital Site

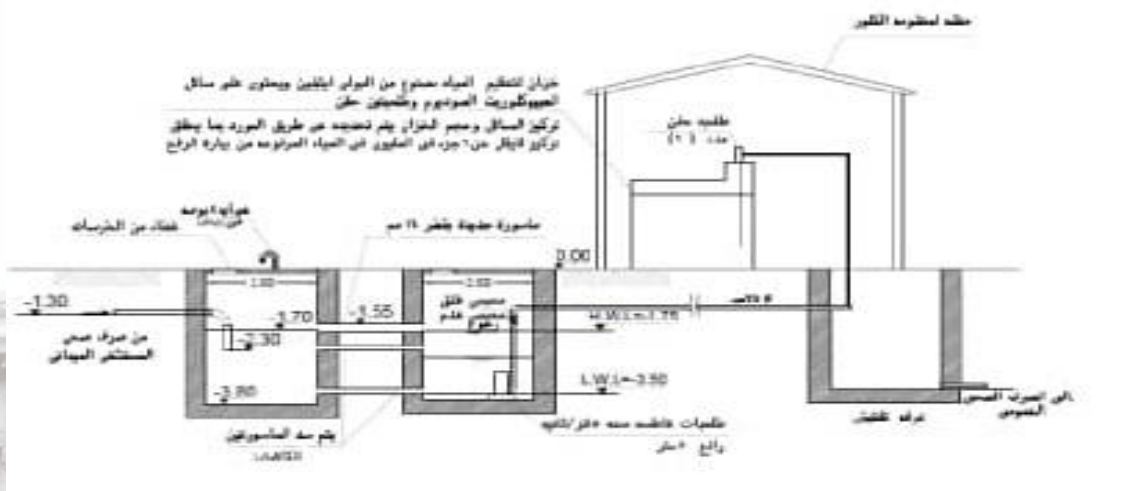


Figure (8) Drainage Pipes



Figure (9) Image of the internal room equipment





Figure (9) Image of bed preparation inside the Hospital



Fourth: Procedures

Conducting PCR tests to detect the Coronavirus:

It is performed for all patients according to the agreed treatment protocol and the results of each patient are kept in his/her medical file.

Catering services:

- Feeding: wrapped meals are delivered to the nutrition technicians for distribution to patients and handed over to the nursing staff to place them next to each patient's bed with water, hot water and tea.
- Hygiene: cleaning is done twice a day with disinfectants (dilute chlorine) and with using sprays for external disinfection.
- Laundry: single-use supplies are used, and in the event that there is something that needs washing, clothes are collected in blue bags for each patient, on which his/her name and bed number are written, and enveloped to the worker, collected in special containers for washing and sent to the laundry.
- Waste:
 - Waste is generally collected in red bags and placed in covered containers at the place of waste collection.
 - Solid waste collection places (temporary places) until transported by vehicles designated for transporting sanitary waste.
 - The Cairo Health Affairs Directorate sends the waste car twice a day for its collection and safe disposal twice a day
- **Occupational Safety and Health:**
 - Taking into account the health and safety of workers in determining the entry and exit of patients and workers in different paths to ensure no mixing.
 - The evacuation plan is attached in the event of a fire or any emergency.
 - Drainage: through pipes and is disinfected before drainage to the main network.
- **Civil Defense:**
 - A fire-fighting vehicle is present inside the Field Hospital throughout the day.
 - Fire extinguishers are distributed in the place in addition to fire blankets.
 - The walls are made of fire-resistant materials.
 - Attached is the civil defense plan to confront fire.

In the event that a medical aid is needed for one of those present:

- There is an ambulance at Ain Shams University on an ongoing basis in the Field Hospital to transport patients when needed.
- In the event that a patient suffers from an emergency that is not a complication of corona (such as a heart attack or a stroke, ...) the patient is transferred to Ain Shams University Specialized Hospital, Al Obour, or one of the isolation hospitals of Ain Shams University by an ambulance from Ain Shams University.

In the event of death:

- An Ambulance is summoned from the Ministry of Health and the patient is transferred to Ministry of Health hospitals to take the necessary measures.
- The deceased remains in his/her place until he/she is transferred by the Ministry of Health.

Fifth: Medical and support teams

Work teams:

- A table is prepared with the names of the work teams with phone numbers, address and national IDs, as well as the team that will receive received the shift duty from them.
- Table (5) the shift duties of the different work teams before starting work.

S.	Team Member	No.	Remarks
	Hospital Manager	1	Lecturer or associate professor
	Physicians	8 + 4 Intensive Care	Family medicine - internal medicine - pulmonology- endemic diseases - geriatrics - intensive care - radiology It has been arranged with the heads of the concerned departments to provide two other physicians ready to join their colleagues in the event of an increased need for medical supervision.
	Pharmacists	4	
	Nursing	52	Internal: 1 per 10 beds Care: 1 for every 3 beds

			2 Nursing Supervisors
	Nursing Assistants	8	
	Infection-control Nursing	2	
	Radiation Technician	2	
	Lab. Technician	2	Samples are sent to Ain Shams University Specialized Hospitals laboratories
	Total	83	
	General supervision on the administrative team	2	
	Data entry and medical registration workers	3	
	Security	6	
	Maintenance	3	Electrician - Plumber - Carpenter
	Occupational Safety and Health	2	
	Civil Defense	2	
	Storage	1	
	Nutrition	- to receive food	Self-preparation of food by Aman and its delivery is made by the company and 2 technicians outside the Hospital and delivered to nursing for distribution
	Laundry	-	Single-use sheets are used, and in case of need, one of the nursing assistants is assigned to send the laundry to laundry in Ain Shams University Specialized Hospital
	Total	21	
	Hygiene and garbage gathering for patients	22	Queen Service Cleaning Company

	Total	22	
	Overall total	126	

4. Description of the basic environment

First: the natural environment

Climatic characteristics of Cairo Governorate

Climate has its primary role in influencing the ecosystems in any region, whether agricultural, urban or water systems (lakes and rivers) in addition to its direct impact on humans and the impact of different crops on their life stages, and the effect of high temperatures on increasing evaporation rates and increasing droughts in marginal areas. Its effects are also evident through rainstorms that cause floods, as well as the effect of winds in arousing the dust and sand dunes crawling towards urban centers and the resulting desertification of agricultural lands.

The climate in the region is largely homogeneous, despite the presence of some parts of the region in the eastern and western desert have a clear impact on the presence of some differences in the elements of the climate.

The southwestern desert area includes the Bahariya Oasis because of its desert climate that is different from its north, which is geographically part of the Nile Delta, and it is hotter and less humid in the summer than the rest of the region, and the speed of the winds is less whenever we head south within the region, and the rainfall increases in the north.

Table 2: Distribution of climatic characteristics of Cairo Governorate, including the project area

Station	Annual Temperature			Annual Rain	Relative Humidity
	High.	Low.	Mid.		
Cairo	28	16	21	13.4	53 %
Giza	28	14	21	11.5	58 %
Helwan	28	16	21	12.8	54 %
Bahariya	30	14	30	2.8	34 %
Qatameya	27	13	20	7.3	52 %
Fayyoun	22	15	30	3.7	51 %

Wind:

Wind is one of the most important determinants in planning and designing urban blocks because of the direct impact it causes on them. As well, winds accompanied by dust lead to obstructing vision and cause some manifestations of pollution, and winds

can be defined by two basic measures, namely speed and direction, and from analyzing the wind cycle we conclude that the prevailing wind is mostly northeasterly in spring, northerly in summer, north to northeast in autumn, and westerly in winter.

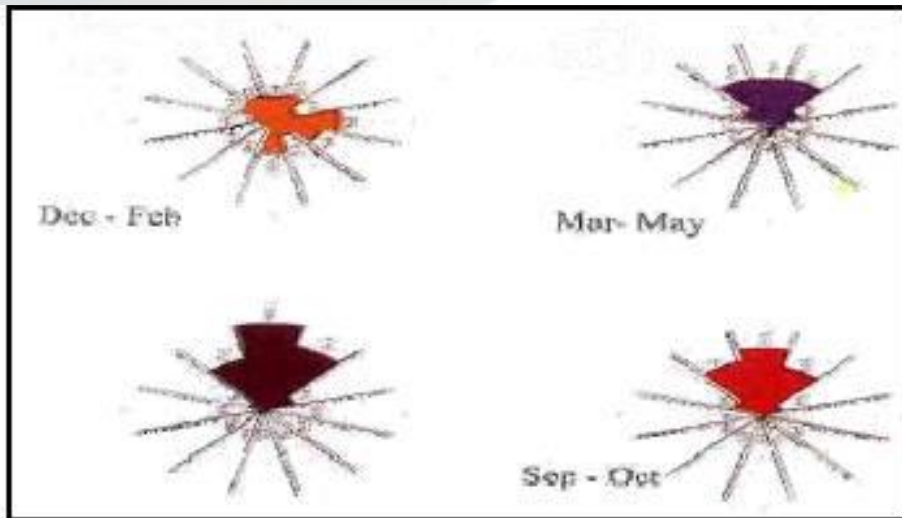


Figure (11) Directions of the prevailing wind

Rain:

The territory is located within the dry tropical climate, and therefore it is characterized by the scarcity of rain during the winter months, which is caused by the blows of northern winds coming from the Mediterranean Sea. However, the territory's remoteness from marine influences has a role in the prevalence of drought, so the amount of rain in the region does not exceed 14 millimeters per year as shown by the rain map.

Relative humidity:

The territory is characterized by an average percentage of relative humidity, and the humidity decreases clearly in the territory in the direction from north to south, in addition to the direction towards the desert parts, and its percentage reaches only 34% in the Bahariya Oases away from the Nile Valley.

The humidity in the air decreases sharply when the country is exposed to the blowing of the Khamseen winds, at the forefront of the atmospheric depressions that blow over Egypt during the period between March and June, which are dry, hot, dusty winds that lead to move soft sand to a degree that may obscure the vision, in addition to a decrease in the relative humidity as in the following figure and the maps for the same.

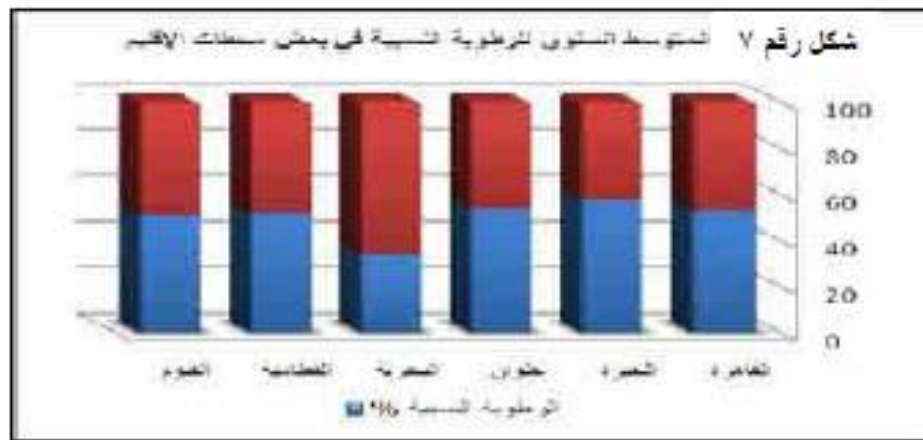


Figure (12) Relative Humidity

Geomorphological (rocky) characteristics of Cairo Governorate

Four geomorphological units can be distinguished in the Governorate, and these geomorphological units consist of the modern alluvial plains, the ancient alluvial plains, the structural plains, and the structural calcareous plateau. The following is a description of the geomorphological units in the Governorate.

A. Modern alluvial plains

There are modern alluvial plains along the Nile River in the west of the Governorate, and below these plains are sediments of silt, mud and a little fine sand of the Holocene era, and the surface of the land is flat with these plains in general, where the height of the land surface ranges between 23 meters above sea level in the south of the Governorate to 16 meters above sea level in the north of the Governorate.

B. The ancient alluvial plains

It is located in the north of the Governorate between the structural plains and the modern alluvial plains, as it appears in the south of the Governorate between the structural plateau and the modern alluvial plains, and below it is the sediment of the Pleistocene era consisting of sand and gravel with some clay lenses and the surface level of these plains ranges between +16 meters to +50 Meters approx.

C. Structural plains

The structural plains are located in the north of the Governorate and their height ranges between about 50 meters to 350 meters above sea level, and below these plains are sediments whose ages range between Oligocene and Quaternary, which are mainly sediments consisting of sand and gravel with clay intrusions, while these

sediments in the northeast of the Governorate are limestone sandstone, as some volcanic eruption of basalt rocks appears within these plains.

D. Structural calcareous plateau

The structural plateau is located in the south of the Governorate, and its height ranges between 50 meters to 550 meters above sea level, and below this plateau are rocks of limestone, marl and sandstone limestone, which belong to the Eocene era, and this plateau is intersected by a large number of unconformities in two directions, one of which is east-west and the other is northwest-southeast. There is no doubt that these unconformities have a great influence on the geomorphology of the Governorate, which resulted in the formation of cliffs, basins, depressions and heights spread across the plateau.

Geological Characteristics of Cairo Governorate

A. Quaternary Sediments

Holocene sediments: Holocene sediments appear on the surface west of the Governorate along the course of the Nile River. These sediments consist of silt, mud and a little fine sand, and their thickness varies from one place to another, ranging from one meter to more than 15 meters.

Pleistocene sediments: These sediments are located below the Holocene sediments mentioned previously, as they appear on the natural surface of the earth near the edge of the floodplain in the north and south of the Governorate, and it consists of sand and gravel with some clay lenses. The thickness of the Pleistocene sediments in the Governorate ranges from 50 meters to 100 meters, and the thickness increases in general in the direction of the Nile River, as well as in the northeast of the Governorate there are unmarked loose sediments that are valleys sediments belonging to the Pleistocene era and their thickness ranges between 100 meters to 150 meters.

B. Pliocene sediments

C. Miocene - Pliocene sediments

The Miocene-Pliocene sediments appear on the surface in the northeastern part of the Governorate. It consists of sand, gravel and some clay lenses, and its thickness ranges between 150 and 200 meters.

D. Miocene sediments

Miocene sediments appear on the surface in the north of the Governorate, and in most of the Governorate they consist of sand and gravel, with the presence of fossilized wood, and in the northeast of the Governorate it is sandy limestone, and the thickness of the Miocene sediments in the Governorate ranges between 150 and 200 meters.

E. Oligocene sediments

Oligocene sediments appear on the surface of the earth by the Governorate and are composed of sand and gravel, and their thickness ranges between 150 and 200 meters, and these sediments may be topped in some places by basalt rocks of the same era, with a thickness of between 20 and 30 meters.

F. Eocene sediments

Pliocene sediments are located at the bottom of the Pleistocene sediments in the Nile Valley, and are composed of dark mud with lenses of fine sand, and these sediments reach a thickness of more than 200 meters and are located below the Pliocene

sediments in the Nile Valley, as they appear from the natural surface of the earth forming structural plateaus in the south of the Governorate, and it is composed of limestone, marl and sandstone, with a thickness of more than 200 meters.

Second: Population

Population data is of great importance for developing and formulating development plans and programs, in light of the absence or weakness of population data, planners and decision-makers will not be able to formulate sound development policies and plans that meet the needs and living requirements of the population at the very least.

In addition, it allows setting appropriate remedies for any deficiencies or defects in implementing development plans and programs, or establishing successful solutions to planning and developmental issues for the community under study. Despite the amendments that were made to the administrative map of the Republic to make the Greater Cairo Region include 5 governorates, after they were 3 governorates, their population sizes and spatial possessions have not changed much.

The following table shows the population size, the absolute and relative spatial size of the planning regions of Egypt, and the general population density in them. The population distribution in the region differs as a result of the difference in its natural and human conditions from one site to another. The population of Cairo Governorate has reached about 8.6 million people, becoming in the first place among the governorates of the territory despite its narrow area, which does not exceed 240 km², and places it in the second-to-last place among the governorates of the territory. Therefore, the general population density reached 30 thousand inhabitants / km². This situation is considered a natural result of the distinguished location of the Governorate on the eastern bank of the Nile River before its branching into Damietta and Rasheed branches, as it was for the distinguished historical situation of the city, and the multiplicity of urban attractions (education in all its stages, health, economy, entertainment, etc...). All of this had a role in distinguishing the governorate with its high population on the one hand and its high-density rates.

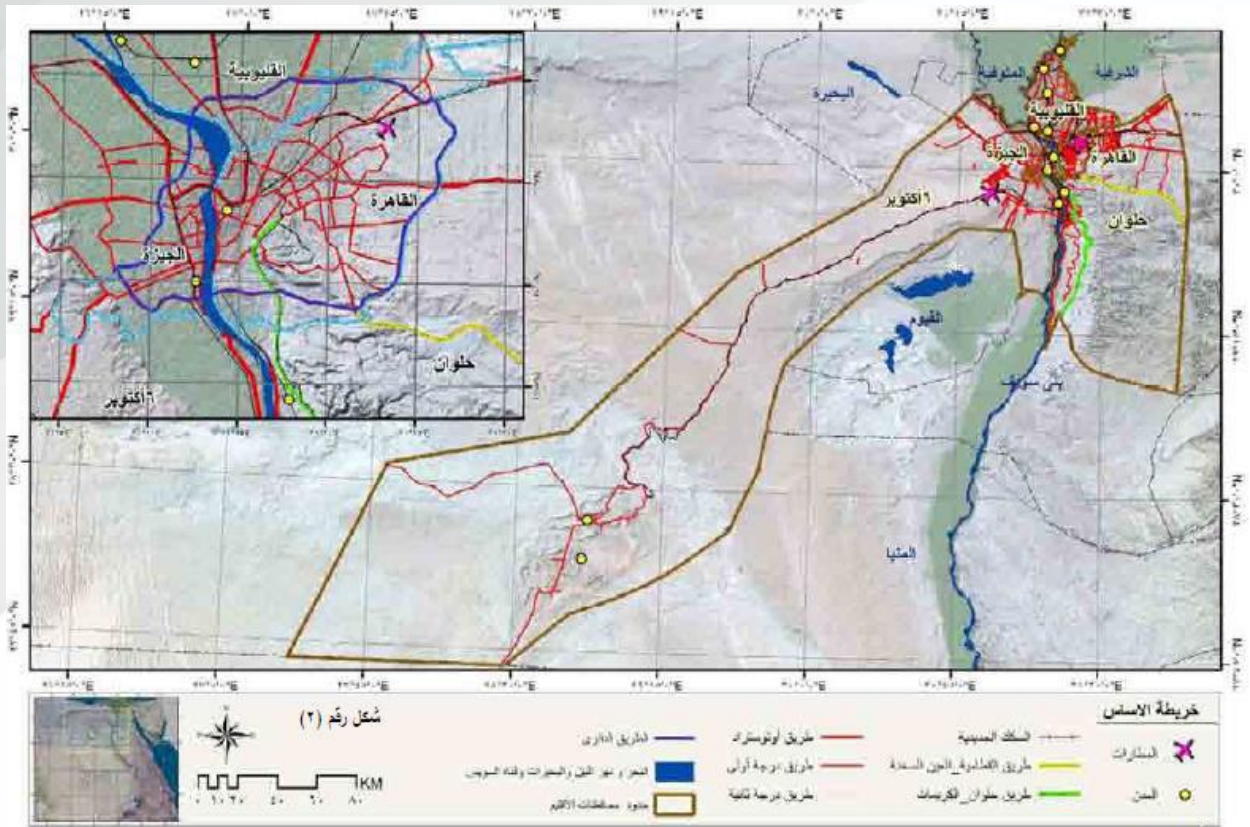


Figure (13) Geological Characteristics

Third: Infrastructure

A) Roads

The Cairo territory is distinguished by the existence of a good and integrated network of roads and railways that link it with the surrounding territories and most capitals and major cities in neighboring and distant governorates as well, due to the fact that it is the capital territory and the center of convergence of all road networks nationwide, and the local road network in the territory enables to reach all parts of the territory, where local networks link the internal central territories to the outskirts of the territory.

B) Drinking water and wastewater services

According to the 2019 data for drinking water and wastewater, it was found that the highest per capita consumption of drinking water in urban areas is in Cairo Governorate (628 liters/ day), and in the countryside in the 6th of October city it is (149 liters / day). As for wastewater, it turns out that the maximum daily disposal rate per person is found in urban Cairo governorate (338 liters / day), and in the

countryside in 6th of October city (41 liters / day), while drainage service is almost non-existent in the countryside of Qalyubia Governorate.

C) Electricity services

The public electricity network is the source of electricity in Cairo Governorate.

Based on the foregoing, we find that the Hospital is located on the campus of Ain Shams University of Cairo Governorate and that this area is surrounded by all activities that do not have any negative impact on the environment. The region also has all the services and infrastructure, and there is no impact by the hospital on the surrounding environment, rather there is a positive impact from contributing to the Corona pandemic by providing a field hospital to serve citizens in this crisis.

5. Environmental impacts and mitigation measures during the implementation of the project phases

5.1 Introduction

The aim of the EIA study process is to study, analyze and evaluate the various activities accompanying the operating phases of the proposed project. The EIA study should help in ensuring sustainable and environmentally sound environmental development by providing all necessary environmental information to determine the compatibility of environmental requirements and standards for the proposed project. The interaction between project aspects and the basic environmental and social conditions is a strong and important basis for EIA for the proposed project. The EIA study is summarized in the evaluation of the impacts associated with the proposed project on the surrounding environment, land, biological diversity, and the human environment. It is important that, when implementing the proposed project, the concentration of the emitted pollutants resulting from the project's activity must adhere to the permissible limits according to the Environmental Law No. 4/1994 as amended by Law 9/2009 and any other related laws.

In this part of the study, we will review the impact of the project on the ecosystem in all its environmental, social and economic components. The following table lists the components and assessment of the ecosystem that are of significant environmental and social importance. The impact of the project on all these ecological components will be assessed, and recommended proposals will be developed to ensure that all negative impacts are minimized and/or avoided.

Table (6) Ecosystem components and their assessment

Category	Ecosystem components and their assessment	Importance
water	Groundwater quality	<ul style="list-style-type: none"> • Issues of sustainability and local use
	Surface water quality (fresh water)	<ul style="list-style-type: none"> • Issues of sustainability, local use and health implications for all users
Air and climate	Air quality	<ul style="list-style-type: none"> • Impact on living beings • Contribution to global warming
Earth	The nature and uses of the land	<ul style="list-style-type: none"> • Earth shape change • The importance of the role of the local community • Surrounding land use
Environmental Cover and Biodiversity	Terrestrial environment and biodiversity	<ul style="list-style-type: none"> • The importance of the value of biological diversity • Community use
Human environment	Socio-economic activities	<ul style="list-style-type: none"> • Job opportunities (positive impact) • Increase of environmental awareness (positive impact) • Safe disposal of hazardous waste (positive impact)
	Health and community safety	<ul style="list-style-type: none"> • The importance of local community health
	Noise Pollution	<ul style="list-style-type: none"> • The importance of the local community
	Agriculture	<ul style="list-style-type: none"> • Economic and social importance

		<ul style="list-style-type: none"> • Social and national value
--	--	---

5.2 Environmental impacts

Environmental impacts occur through environmental aspects and can have a direct impact on the surrounding environment, and may indirectly contribute to a greater environmental change or be cumulative changes. This section reviews the components of the ecosystem, their assessment and their potential, and a discussion of the expected impacts that may result from the aforementioned environmental aspects.

First: liquid wastes

The final disposal of liquid waste (medical and drainage water) resulting from Ain Shams University Field Hospital is to the University's sewage network and is divided into:

(A) Wastewater: Hospital drainage contains large quantities of infectious disease microbes, including bacteria, viruses, and worms, which are easily transmitted through the water, as wastewater is polluted from communicable and infectious diseases departments from patients with intestinal infections or during epidemics.

(B) Hazardous chemical liquids: resulting from the daily sterilization and cleaning of devices, equipment, surfaces and floors where there are large quantities of solvents, including organic and inorganic acids and alkalis, which are discharged into public sewers from laboratories and pathological laboratories without being processed.

(C) Pharmaceutical wastes: small quantities of medicines that are discharged into public sewers from different medical departments, and these medicines may contain antibiotics and toxic drugs.

Second: air, climate, dust generating and suspended particles

Air quality may be affected during implementation steps. It may also be affected by the occurrence of non-routine events, and the impacts resulting from the following environmental aspects are as follows:

- Accidental events: fires and explosions
- Air pollution inside the work environment

Third: Pollution of the surrounding environment with medical waste

Ain Shams University Field Hospital waste represents all hospital waste.

It is classified into several types according to their nature and the method of processing them.

1.1 Solid waste: The solid waste discarded from Ain Shams University Field Hospital in general can be divided into several sections that differ in their nature, methods of handling with them and methods of disposal, namely:

- ❖ Ordinary waste: It is the result of administrative and office activities and includes paper, newspaper waste, plastic, glass and metal cans.

Waste resulting from treating patients and what is more than needed and medicines that have expired: represent the waste resulting from its expiry date or the waste resulting from food leftovers.

Infectious medical waste: it may be the result of blood laboratories, bacteriological, viral, parasitic and fungal tests, or it may be used by patients (such as bandages, needles, blades, medicine containers, plastic tubes or bed linen, contaminated pillows and human parts) of which severity varies according to the potential disease, and pathological samples (for patients), which have been laboratory tested and their remains were thrown into containers and they have great impact on infection among healthy people. It is necessary to have full awareness of all the risks of pathological samples and their immediate destruction within appropriate safety and security measures.

The environmental aspect is one of the basic elements that is affected by the activities accompanying the establishment of any project that has outputs that can interact with the environment. The main environmental aspects associated with the project will be reviewed.

The following table illustrated the project impact on the environment and table (8) shows the environmental aspects and their impact on the project.

Table (7) Environmental aspects that are likely to be impacted by the project

Activity	Potential Environmental Impact	Waste type Gas/ liquid/ solid
1. Hospital cleaning and sterilization operations	Pollution of the sewage network	Liquid

2. Nursing and medical procedures	Pollution of the work environment and the surrounding environment of hazardous waste	Solid
3. Use of medicinal gases	Potential air pollution due to a gas leak	Gas
4. Medication use and storage	Pollution of the work environment	Solid/ liquid
5. Hospital administrative work	-	-
6. Transportation of medical waste	Pollution of the work environment	Solid
7. Storage of medical waste	Contamination of the store	Solid
8. Accumulation of deaths inside the hospital	Pollution of the work environment	Gas

Table (8) Analysis of the potential impacts of the environment on the project

Environmental Risk	Expected risk outcome	Preventive Measures
1. Earthquake	<ul style="list-style-type: none"> - Chemicals are included and the possibility of fires - Buildings collapsing 	<ul style="list-style-type: none"> - Separators are placed between buildings to protect the building from earthquakes - Separators are created within the drug stores
2. Torrents	<ul style="list-style-type: none"> - A breakdown in the hospital's drainage system 	<ul style="list-style-type: none"> - Establishing an infrastructure to absorb torrents and rains
3. Fire	<ul style="list-style-type: none"> - Hospital deaths, injuries and destruction 	<ul style="list-style-type: none"> - Emergency and fire plan - Activating occupational safety and health measures

3.5 Expected environmental impact mitigation plan

Medical waste: There are many traditional methods of handling medical waste, such as incineration in axial furnaces, pressure and heat sterilization, as well as microwave processing or chemotherapy.

First: Processing medical waste

Supplying a shredding device for processing hazardous medical waste with the following specifications:

Technical Specifications of the Hazardous Medical Waste Disposal System of the brand ECODAS, TL50 Model.

- The device chops and sterilizes with one unit.

Liquids - glass - blood bags - experimental animals - syringes - the possibility of getting rid of all types of pollutants (plastics, ... etc.) sharp machines - organic.

- There is a special cycle to get rid of blood

- The possibility of reducing the volume of waste to reach 20% of its original volume

- The upper tank capacity for chopping is 150 liters

- The device can withstand a steam pressure of up to 9 bar

- The sterilization is carried out at a temperature of not less than 138°C and an air pressure of 3.8 bar

- The average cycle time is 30 minutes, and the average weight of waste per cycle is 25 kilos

- The device works automatically from the beginning of the cycle until its end with the presence of a control unit and a screen to show all stages of the device's work with the possibility of programming according to work requirements with the possibility of manual operation

- The device chops the waste first, which leads to steam penetration to all materials to be disposed of, such as blood bags - dialysis filters ... etc. then sterilize them with steam only in one device to prevent the spread of infection as a result of frequent handling

- The device is equipped with an automatic programmable system for operation and protection with a mechanism for discharging the wastes resulting from processing

- The device is equipped with an indicator to indicate the completion of the cycle and indicators showing the start of operation, pressures, temperature and the end of operation, and the device can only be opened after the completion of the cycle (chopping and sterilization) and to ensure that the waste is sterilized and the device does that automatically without any human intervention

- The device is equipped with an alarm system for any security failure in the unit, any sudden failure in the unit, and any temperature increase above the maximum or permissible limit.

- The possibility of printing reports after each cycle by printing attached to the device
- Control system for all functions and programming by PLC
- The processing result is not harmful to health and physically unharmed
- The device is equipped with an emergency program in the event of any technical failure
- No need to use any chemicals or solutions while operating
- No need for special bags to sterilize the waste
- The wastes are not mixed with cooling water or drainage to prevent biological or chemical contamination of wastewater.
- A set of knives for chopping from a durable material
- Lower operating costs
- No noise, vibration, emissions, harmful gases, or harmful exhausts
- The power supply is 380 volts / 50 Hz
- The system holds the following approvals:

Environmental financial study for Field Hospital at Ain Shams University

- The Hospital has a capacity of 176 beds

The devices required to process hazardous waste at Ain Shams University Field Hospital (Table 9)

Item No.	Description	Qty	U. Price LE	T. Price LE
1.	ECODAS T 150 Made in France For Fragmentation and Sterilization of Hospital Waste <u>With</u> Electric Steam Generator Made in France	1	4000000.00 LE	4000000.00 LE
Total: (an amount of four million Egyptian Pounds only)				4000000.00 LE

To calculate the average cost of solid waste (Table (10))

Device Name	Cost	Total beds	Average waste calculation	Total cost / 1 kg waste
ECODAS T 150	4000000	176	1 kg waste	22727

The second alternative to disposing of waste is to collect medical waste in designated rooms in double bags (double - triple) and then deliver it to a contractor of the Ministry of Health to be destroyed along with the waste of government hospitals

Second: liquid waste

Drainage water is collected in pipes and is purified before drainage to the main network because most research has proven the presence of covid in the wastewater, and therefore drainage chlorine must be added, before it is discharged to the drainage networks and after dilution so that the chlorine percentage in the wastewater does not exceed 0.3%.

Infrastructure must be established to accommodate rain and torrents

Third: air pollution inside the work environment

There are different air purification systems, and they will be compared and the best method will be chosen according to the available resources as follows:

1. Genano Technology

- The Genano system depends on electrical filtration that does not need to be changed, such as mechanical or fiber filters
- The scales of plankton, bacteria and viruses reach 99.5% for sizes up to 0.001 microns.
- The device gets rid of anesthetic gases and odors by means of an active carbon filter that is changed once a year
- The device can convert the room to positive or negative pressure without special equipment
- The device runs automatic cycles regularly for self-cleaning, and these cycles can be done manually when needed
- The noise emitted by the device is about 40 dB, which is much less than the permissible rates globally, and it does not emit any vibrations

- The body of the device is made of stainless and shock-resistant and anti-rust coated metal
- Does not require any operating chemicals
- The device is characterized by ease and cheapness of operation and maintenance, and it also works in harsher temperatures and humidity than the conditions in Egypt

2. HEPA Filter

- It needs constant change of filters every short period, which raises the cost
- Its effectiveness in retaining plankton and very small particles is limited
- Moisture causes the fungus to grow
- The more particles are retained, the less effective the filter and the greater the noise
- The filter is constantly clogged
- Accumulation of bacteria and fungi on the filter, which makes it a source of pollution
- It does not block out anesthetic gases or harmful odors
- It needs special ways to get rid of it because it does not kill bacteria, it just keeps it

3. Ionizers

- It is not classified as a medical device
- It depends on ionizing the air outside the device and thus ionizing suspended particles that have been deposited on the walls and floors (does not trap or kill the particles)
- Workers in the place are exposed to different ions, which may affect their health, especially from the positive ions
- It works in a limited space only
- It has a short shelf life
- It has a limited ability to kill microbes and viruses
- It has no effect on eliminating anesthetic gases or odors
- It has no ability to create positive or negative pressure in the room

4. U.V. light

- Ultraviolet rays are harmful to human health and cause types of cancer, especially to the skin, and are harmful to the eyes
- UV rays have a very weak ability to penetrate, and this greatly reduces their effectiveness in killing bacteria
- It needs special ways to get rid of bacteria because it does not kill bacteria, it only retains it
- It has no effect on eliminating anesthetic gases or odors

- Ozonization

- Ozone has great harm to human health, especially on the respiratory system, affects the sense of smell, and causes irritation in the throat and bronchial
- Ozone causes damage to materials made of rubber

It needs special methods to get rid of bacteria because it does not kill bacteria, it only retains it

- It has no effect on eliminating anesthetic gases or odors

The best pursuant to the comparison is the following device for the quality of air in internal environment:

Item No.	Description	Qty	U. Price LE	T. Price LE
1.	Genano4500 MANOAL & AUTOMATIC	3	21000.00 LE	630000.00 LE
Total: (an amount of six hundred and thirty thousand Egyptian Pounds only)				630000.00 LE

6. Analysis of project alternatives

In this section, alternatives to the proposed project to establish a field hospital in the Coronavirus pandemic will be discussed

6.1 Alternative for not implementing the project

- The absence of any places to receive Coronavirus patients
- Patients are crowded in hospitals
- The spread of the disease as a result of the lack of hospitals

6.2 Establishing the Field Hospital in another area, for example, Al Obour

This alternative has been studied and found that it is not suitable for the unavailable land to establish the hospital and the distance from Ain Shams University Hospitals, which makes it difficult to take advantage of the existing capabilities with the increase in cost.

6.3 Establishing a field hospital on the campus of Ain Shams University

This alternative was chosen for implementation from among all the proposed alternatives and which was studied in detail in Chapter Four of this study. It includes the establishment of the hospital on the campus of Ain Shams University next to the Ain Shams Specialized Hospital, where it is possible to take advantage of the capabilities of Ain Shams Hospital, as indicated in Chapter Four including physicians and workers, staff accommodation, sterilization and availability of land suitable for the hospital.

7. Environmental management and monitoring plan

7.1 Environmental Management

Environmental management systems are a fundamental pillar for increasing the efficiency of institutions, increasing their competitiveness and maximizing their profitability, through their contribution to eliminating pollution, developing environmental performance, and reducing costs, reducing accident rates, as well as increasing the efficiency of workers and raising their level of performance. Following ecosystems improve the reputation of the organization and increase its ability to gain new markets and new customers.

This chapter lists the precise details of the environmental management plan (EMP) that will be applied to all phases of the proposed project and its goal, to develop a framework for EMP and to ensure full assurance of environmental compliance in all project phases, consistency with external standards, and promoting effective environmental management in all phases of the project with its proposed activities.

The purpose of the general framework for environmental management systems is as follows:

- Set a minimum standard for an environmental management system at the project site.
- Provide the framework that can be assigned to an environmental management system for the site, following the selection of the (executive works) for the project.
- Provide a framework for a sound environmental management system during all project phases.

The environmental management plan consists of:

- Emphasizing the presence of the environmental, safety and occupational health management in the organizational structure based on the implementation and management of the project and the development of an environmental management plan during the operation process, including a summary of the important environmental impacts and the mitigation measures followed, which were previously presented in detail.
- Environmental monitoring plan.

The objective of EMP for this ESIA is to provide a strategy for managing expired pesticides with a special focus on protecting the environment during their final disposal in order to reduce their impacts and risks. The following are the matrices of mitigation measures required during the implementation of the proposed project.

Table (11) Mitigation measures required during the implementation of the proposed project

Activity	Potential Risks	Potential activities to mitigate risks	Execution
----------	-----------------	--	-----------

	Injury to surrounding individuals as a result of falling medical waste	Handling and storage requirements for pesticides in stock (explained in Table 3 of the attached risk assessment study)	Training of workers and provision of personal protective equipment
Dealing with contaminated solid waste	Injury to surrounding individuals as a result of direct or indirect exposure to toxic substances	First-aid measures and exposure controls / personal protection to existing pesticides	<ul style="list-style-type: none"> • Training first aid personnel and locate the nearest medical center • Supplying first aid equipment and providing personal protective equipment
	Pollution of the surrounding environment as a result of leakage of hazardous materials	Leakage response measures	Training of workers
	Injury to individuals and pollution of the environment as a result of fires	Fire-fighting measures depending on the fire-fighting plan	Training of workers and availability of personal protective equipment
	Environmental pollution due to spills and leaks as accidents	Accidental leakage response measures	Training of workers
	Injury to surrounding individuals as a result of being in an enclosed space that is not well-ventilated	Accidental leakage response measures and handling and storage requirements	Training of workers and availability of personal protective equipment

	Injury to surrounding individuals as a result of falling solid materials	Handling and storage requirements	Training of workers and availability of personal protective equipment ()
Hospital's impact on the surrounding environment	Pollution of the surrounding environment as a result of storing medical waste	Accidental leakage response measures and handling and storage requirements	Training of workers
	Soil pollution due to leaks or spills	Accidental leakage response measures and handling and storage requirements	Training of workers
	Sewage pollution	Measures of continuous sterilization of wastewater	Self-monitoring
	Injury to the surrounding individuals or animals as a result of exposure to medical waste	First aid measures, handling and storage requirements	Training of workers on handling and storage requirements and educating the population on first aid measures for inhalation and ingestion, and to identify the nearest medical center
	Injury to individuals as a result of fires caused by improper storage	Firefighting measures	Training of workers and availability of personal protective equipment
	Ambient air pollution due to the dispersal of pesticides or emissions when fires occur	First aid and fire fighting	Training workers on handling and storage requirements and educating the population on first aid measures for

			inhalation and ingestion, and to identify the nearest medical center
--	--	--	--

7.2 Environmental monitoring plan

The environmental monitoring plan is an important and necessary component of the environmental management plan and structure. It provides the necessary information for the periodic review and amendment of the environmental management plan, and necessarily ensure the achievement of intra-protection through early detection of negative environmental impacts. Self-monitoring programs address all pollution indicators that help decision-makers to make decisions regarding corrective actions to abide by environmental laws and regulations, and to ensure environmental protection and the safety of the work environment. As well as taking appropriate operating and mitigation measures and following management plans.

Monitoring the various environmental indicators during the normal operating stages is one of the most successful methods used to reduce emissions of all kinds, so that the quality of the environmental components at all times conforms to Egyptian specifications and laws, and at the same time ensuring the continuity of operation in compliance with the limits of the applicable laws. There are a number of monitoring plans that will be implemented as follows:

- Monitoring air quality in the work environment
- Monitoring drainage quality
- Monitoring noise level
- Monitoring hazardous waste

The environmental situation and the environmental impacts of hospitals are in a state of permanent correlation with their general situation. Any deterioration suffered by any health institution necessarily leads to its transformation into a dangerous pollutant for the surrounding environment because the wastes that these institutions dispose of, whether solid or liquid, are usually contaminated with chemicals that are regularly used in these institutions in laboratories, operating halls and emergency hallways, as these wastes are exposed to pollution of another kind, which is contamination by germs and microbes.

The world is witnessing a rapid development in the areas of dealing with waste in general, its recycling and methods of processing in particular, and there is also a focus on the issue of medical waste and methods of processing.

The scientific and indiscriminate disposal of waste from health institutions inevitably leads to environmental pollution, the spread of epidemics and diseases, and poses a threat to human life.

Importance of environmental monitoring of solid waste:

The solid waste presented by health institutions in general can be divided into several sections that differ in their nature, methods of handling and disposal, which are:

- **Usual waste:**

It is formed as a result of administrative and office activities and includes paper, newspaper waste, plastic, glass, metal cans and leftovers.

- **Radioactive waste:**

Resulting from treating patients, or what is surplus from treatment, in excess of need, medicines, or what results from some devices and equipment.

- **Chemical waste:**

It is produced from laboratories for chemical analysis or imaging, acidification, and waste filmography.

- **Infectious medical waste:**

It may be caused by blood laboratories, bacteriological, viral, parasitic and fungal tests, or it may be used by patients (such as bandages, needles, blades, medicine containers, plastic tubes or bed linen, contaminated pillows, and human parts), whose severity varies according to the potential disease.

Importance of environmental monitoring of liquid wastes:

Liquid wastes discarded from health institutions in general can be divided into several sections that differ in their nature, methods of handling and disposal methods, namely:

- **Wastewater:** Hospital sewage contains large quantities of infectious disease microbes, which are easily transmitted through the water, as wastewater is contaminated from communicable and infectious diseases departments from patients with intestinal infections or during epidemics.
- **Hazardous chemical liquids:** resulting from the daily sterilization and cleaning of devices, equipment, surfaces and floors, where there are large quantities of solvents, including organic and inorganic acids and alkalis, which are discharged into public sewers from laboratories without processing.
- **Pharmaceutical waste:** Small quantities of medicines are discharged into public sewers from different medical departments, and these medicines may contain antibiotics and toxic medicines for treating tumors.

- **Radioactive liquid waste:** Small amounts of radioactive liquid waste go to wastewater from oncology departments.
- **Waste heavy metal residues:** Quantities of heavy metals with high toxicity, such as mercury, silver and lead, are discharged from dental services centers and from radiography departments, as well as from the auxiliary technical departments of hospitals such as the department of movement and mechanics.

Importance of environmental monitoring of gaseous waste:

Gas waste is formed as a result of the waste incineration process in the central incinerator inside the complex, where all medical solid waste (syringes, damaged blood bags, plastic nutrient bags ... etc.) are burned and these materials cause pollution if they are burned under a suitable temperature due to the formation of dioxin, which consists of hundreds of chemicals, remains for long periods in the environment because dioxin does not interact with oxygen and water and is not degraded by bacteria.

First: Monitoring the air quality in the work environment

The concentration of the following elements will be measured in the air of the work environment to ensure that they do not exceed the permissible limits.

- **Respiratory particles:** They are found in dust and cigarette smoke in the outside air, and are emitted when cooking and heating food.
- **Biological pollutants:** mold and bacteria found in dirty ventilation filters and humid environment.

Second: monitoring the quality of wastewater

The quality of wastewater will be measured before it is discharged to the drainage networks, and the chlorine percentage should not exceed 0.3%.

Table 12: Monitoring wastewater quality

Temperature
PH
Absorbed bio-oxygen
Consumed chemical oxygen
Oils and greases
Suspended aggregate materials
Sulphides
Total nitrogen
Total phosphates
Cadium
Copper
Heavy macro metals

Table (13) Environmental Monitoring Plan for Hospital Waste (Solid - Liquid - Gas)

S .	Sources of pollution	Cause of pollution	Affected environment	Monitored material	Monitoring method	Monitored rate
1	Hospital cleaning and sterilization operations	Disposal of it on the drainage network causes sudden pollution loads	drainage network	organic materials BOD, COD resin acids chlorinated organic materials nitrogen, phosphorous suspended solids metals, salts colored materials	Analysis	Every 3 months
2	Nursing and medical procedures	Pollution of the work environment and the environment surrounding to hazardous waste	work environment	boiler ash lime clay dregs sand and stones sludges	Material balancing	Every 3 months

3	Use of medicinal gases	The possibility of air contamination due to a gas leak	air	air pollutants (according to the chemicals used)	Gas analysis device	Every month
4	Medication use and storage	Pollution of the work environment	work environment	liquid materials solid materials	Analysis	Every 3 months

8. Emergency plan and occupational safety and health measures

The potential emergency in any project may cause injuries, loss of life, property damage or obstruction inside and outside the project boundaries, especially as the waste that is the focus of operations and handling is hazardous waste. It is possible that emergencies or fires may result as a result of wrong handling of those pesticides or abnormal operation onsite or due to external conditions. If the emergency becomes out of control, it can cause loss of life, property and neighboring facilities, and in this case, it can be defined as external emergency. As for emergencies that can be controlled by the available means and that do not extend outside the facility's boundaries, they can be defined as internal emergencies. There will be an emergency plan to respond and mitigate the consequences of any potential accident to reduce the impact on workers, society and the environment. Workers are trained to implement the plan and to respond in an emergency situation, and the following must be adhered to:

- Raise the level of environmental awareness among workers and train them to respond to emergencies and mitigate their potential impacts
- Handle pesticides on foundations that raise safety factors and prevent accidents
- Prepare an integrated accident and safety instructions samples and record

In addition, the contingency plan that will be applied includes dealing with the following situations:

- Preparations include identifying means of communication with government authorities, organizations and individuals concerned with rescue and harm reduction.
- Response includes actions necessary to reduce loss of life and property damage and providing emergency assistance.

- Restoration of normal condition, which includes short and long-term activities that restore operations to normal and help restore the surrounding environment to its previous condition.
- Mitigation includes activities that remove or reduce the disaster potentials.

Objectives of the onsite contingency plan:

- Control emergencies
- Protect the lives of individuals
- Minimize damage in hospital area and surrounding environment
- Restore the normal state

8.1 procedures for dealing with fire

What is an emergency evacuation?

It is the process of moving people from a dangerous area (because there is a threat of danger, or an actual disaster) to a safe area. For example: an evacuation based on suspicion of a bomb or fire.

Based on the foregoing, it is clear that evacuation takes place:

Before the disaster;

During the disaster; or

After the disaster

Psychological factors in evacuation, and why do people refuse to evacuate?

Lack of security, and this may be due to the presence of an actual threat outside (security or military, fire, ...). The outside is not safe for one's life or because one does not trust his/her neighbors, so one cannot secure his/her home and property if he/she leaves it from theft or loss or the ineffectiveness of the means of transport. I may be asked to evacuate from a city or island and I have the desire for it, but I do not have a means of transportation, the roads are destroyed, and the authorities ignored providing them or did not provide them sufficiently.

Weak social bonds

Where the strong checks on the weak and help in the evacuation, and secure his/her needs, whether by collective protection, transportation, shared accommodation, and even

temporary shelter until the danger passes. As for the shelters, they need solidarity, social intimacy and bearing the other.

Weak community systems, some societies lack:

Charitable social institutions.

Fire

It is a self-contained oxidation process accompanied by heat and light, and is able to continue or increase in the event of continuous supply of oxygen and fuel, and smoke and toxic gases cause damage much more than what is caused by flame, which is the most important reason for emergency evacuation.

Causes of death in fires:

- Choking
- Thermal injury
- Injury from an associated blast
- Fear and stampede injuries

Smoke danger:

Fire smoke consists of many gases that are highly toxic or irritating to the respiratory system and eyes. Among the most dangerous is carbon monoxide, which may lead to poisoning alone or in combination with some other gases such as hydrogen cyanide gas and oxygen, and inhalation of fumes leads to rapid disability and consequently loss of consciousness and death.

For a much faster and wider movement of smoke than a flame, most deaths and injuries in fires are caused by inhaling toxic fumes from a fire. Rapid smoke travels in the open skies, and into buildings through open doors and air conditioning piping networks, over false ceilings and through extension openings and non-breaking division walls in buildings.

Smoke movement

First: to the ceiling of the room

Second: Fill the room atmosphere

Thus, it is possible to escape in the event that you are in an escape route full of smoke by going down to the ground groveling or crawling towards the smoke that is above. Also, you must close all doors and ventilation openings for smoke confinement and give everyone a better and longer chance to escape and survive.

Reasons for emergency evacuation in hospitals

An internal disaster. Transferring patients and workers from an actual or anticipated danger such as (fire, bomb ...) in order to provide them with protection.

External disaster. Emptying hospital beds to take care of injured people coming from an external disaster.

Types of evacuation in buildings:

Horizontal evacuation: from a dangerous area (or the need for) to its security area (another fire sector separated with doors and breaking walls resisting fire and smoke) on the same floor of the building.

Vertical evacuation: Evacuation to a safe area on another floor of the building.

It can be partial or complete evacuation to the outside of the building.

For the hospital to be considered safe and to prepare it for any evacuation in the event of a disaster, the following is required:

A disaster (emergency) committee shall be formed, headed by the director of the hospital (the institution), with the membership of the heads of major departments in the hospital.

Establishment of the basic equipment for safety and security in the hospital (facility).

Building safety for use as a sanitary facility.

Structural components are resistant to fire for at least 4 hours. The external cladding of the building's external walls, walls, and the roofs of escape routes and patient rooms shall not be less than Class (A), which is non-combustible materials in accordance with International Standard Specifications No. (1182) for the year (1979), and the materials for cladding the rest of the walls and ceilings shall not be less than Class (B), which are materials of low flammability according to the specifications of the American Society for Testing Materials No. (84). Building furniture is of combustion-resistant materials and does not release harmful gases when ignited.

Large buildings consist of several (fire sectors) separate fire and smoke isolation areas (all patient wards are a separate fire area, attic windows).

Risk areas:

The separate fire sectors that are formed, the maximum diameter of the fire sector is 40 meters or an ignition area for fifty patients or employees, the maximum area for the fire area is (2,400 square meters) and the sector has a fire-resistant door for a period of not less than an hour and it is self-closing.

Finding safe emergency exits (means of escape) such as the following places (corridors, doors), extending from the place where people are inside the building to a safe place

outside the building, which is protected from fire and smoke. Its number and width are suitable for the number of the patients and workers, including fire elevators for fire carts for critical care patients. The doors and corridors shall be of fire-resistant materials for at least an hour, and covered with double-electric lighting (emergency lighting) and marked with clear and luminous signals, with maps distributed throughout the building to indicate them. It must always be made sure that it is free of any obstacles that hinder movement in it.

Exit length: it means the distance that a person walks from the unprotected fire zone until he/she reaches the protected area from any point to a security exit, which is 20 meters.

The minimum is two emergency exits.

The minimum net width of the emergency exit (105 cm).

The minimum net width of the emergency exit corridor is (240 cm).

The minimum net height of the emergency exit corridor is (200 cm).

Please provide the appropriate manual fire extinguishers:

Fire extinguisher (powder, carbon dioxide), the powder should not be less than 6 kg, and carbon dioxide is not less than 6 kg, and at least one must be provided for every 100 square meters, and it should not be further than 30 meters from each other. The type, size and area of coverage differ depending on the severity of the area covered.

They are within reach (1 – 1.30 m) and at the exits.

A good security system with a guard

The presence of posters of No smoking, no food entry, and workers entry only in order to provide environmental safety requirements.

Providing personal protective clothing for them.

Finding suitable containers and adequate storage areas for storing differentiated waste (normal materials, sharp materials, vital hazardous materials, ...). A contract must be concluded with the Directorate of Health Affairs for their safe disposal with the provision of a scale and notebooks to record the daily quantities of waste produced for the disposal of various wastes with the presence of suitable grounding areas as well as a lightning rod system.

Gathering areas: They are the areas that are determined inside and outside the building to gather people who are evacuated from the sectors in which the danger occurs, with the

aim of saving them, protecting them and providing the necessary assistance to them, and they are divided into two types:

Internal gathering areas: They are located inside the building, and they are usually spacious, safe and ventilated halls. It has at least two exits to escape to the external gathering areas, which are temporary gathering areas until the danger to the building is completely eliminated, and in the event that the danger exacerbates and the assistance comes to evacuate, the evacuation shall be carried out immediately to the external gathering areas.

External gathering areas: They are set outside the building, and ambulances and services can easily reach them. They are referred to by the engineering drawing in the building and employees are introduced to them when training them on the evacuation and emergency plan and how to use fire extinguishers.

Establishing an effective security and safety department in the facility (hospital).

Emergency evacuation plan:

The goal is to provide the necessary protection for workers and patients in the facility from any danger by finding the best way to evacuate them safely in the shortest time and without panic attacks.

Compulsory emergency training (quarterly) should be carried out at least once a year for evacuation, including transportation of incapacitated patients. The civil defense department in the hospital, the emergency department, safety and ambulance transport departments should be informed about it in advance.

Evacuation time:

It is the time required for evacuation and there are several ways to estimate it, including the actual comprehensive training of the plan.

The time component must be taken in consideration, as the time required to evacuate the building is measured according to its graveness, the materials involved in its construction, and its resistance to combustion.

The rate at which people departure from the exit

It is the number of people who are leave per minute. And it varies according to the type of building, as well as the different exit method, whether it is horizontal or vertical (up or down), and according to the width of the exit.

Horizontal evacuation (30 person / min)

The wall drawing for the evacuation has not yet been completed, and when it is done it will be installed around the corridors and the following will be specified in each banner:

Fire protection and firefighting equipment (fire extinguishers and equipped fire-fighting vehicle) and a statement is attached with the manual fire extinguishers and their distribution areas for personal protection equipment such as (first aid materials, eye sinks, and defibrillator).

One of the conditions for a successful emergency plan is simplicity.

Location of the facility: Cairo - Abbasia

Facility area (4,600 square meter)

Number of floors: ground

Number of beds: 176 beds

A plan of the building in Chapter Three illustrates the fire-fighting tools.

Writing the hospital redistribution areas during the declaration of an emergency, the primary and secondary exits of emergency for the different sections of the hospital, the gathering areas, the temporary safe protection areas and the shelters. An evacuation fee was set up in various areas of the hospital.

The plan outlines the leadership and distribution of elements in the facility.

Determining communication methods.

Functionally determining the tasks of persons and departments in emergency situations.

There is a business card for every major element in the facility.

Three groups are defined therein: Determining groups of workers in each floor or department in order to carry out the tasks of the evacuation process of those present in the facility, and informing them of their tasks and responsibilities when giving the warning to partially or totally evacuate the facility.

Evacuation group

Fire group

Medical assistance group

On what do we depend in making the evacuation plan for a specific building?

The size and complexity of the building.

The ability to move by its inhabitants.

The possibilities of the foundation, and help.

The sequence of the evacuation process:

Discovery.

Decision making.

Warning.

Reaction.

Moving to a temporary protection zone or safe collection areas.

Transport.

The time for the first four steps is called Moving Time.

In the event that you notice a fire, immediately contact the civil defense unit team near the facility, the department of the occupational safety and health, or security department, and close the air conditioning and the doors to prevent the spread of smoke. Call from a safe place the telephone operator (central) to report the fire (region, type, cause, ...) and then do the rest of your tasks in the plan.

A. Evacuation group: In the absence of danger to yourself, first

Ensure that exits are safe, and direct patients who are able to walk through these exits to safe gathering areas.

Help people in the immediate danger area first.

Calm patients, cover them with wet sheets in case the flame and smoke are intense, and ask them to crawl on the way out.

First, release those who are able to walk, then those who need help and then those who need to be fully carried.

Evacuating rooms is made room by room to ensure complete evacuation, then put a paper or sign on the door to indicate evacuation.

Upon evacuation, everyone must go to the known safe gathering area, where you will count the patients and colleagues and submit your report to the head of the Security and Safety Department.

It is strictly forbidden to enter the building again without obtaining permission from the civil defense.

What is a temporary shelter?

A temporary safe zone for the disabled until help arrives to evacuate them.

If you are alone and your exit has been blocked, do not open any door that is hot or releases smoke heavily, try to find a temporary shelter and call for those outside until help arrives.

B. Fire-extinguishing group:

Try to extinguish the fire, if it is possible and safe, with the available means.

Trap fire and smoke by closing doors, windows, and air conditioning, and sealing the bottom of doors by placing damp rags there.

Shut down electrical current and gases from the site and remove any possible apparent cause of fire.

Do not resist fire in the following cases:

You don't know what is burning

The fire spreads quickly

You don't have the right tools

You cannot extinguish the fire because there is a safe exit behind you

The fire may block your way to escape

You may inhale toxic smoke and fumes

Something in you urges you not to do it

Administrative Director Contacts:

Occupational Safety and Health

Civil Defense

Security

Receive directions from the on-duty hospital organizer or the head of the emergency committee

Ask for the hospital's emergency list

Notify the hospital emergency department

Prevent regular calls to keep lines open for emergency calls, and it is best for the Civil Defense Assistance Team to attend which is better than appearing late for a possible rescue.

C. Medical Assistance Group

The screening process begins in the safe gathering area.

Discuss with the site chief on the need to reallocate patients in the hospital, or transfer them to another hospital, with the help of the rescue team.

1. The ignition theory - the fire triangle

First: ignition

Ignition is basically the chemical reaction that takes place between two substances, which are fuel (a flammable substance) and an auxiliary combustion (oxygen).

Fuel: It is the flammable substance or body and there can be several types of fuels. In fact, all other known bodies are flammable, although their flammability varies if the rest of the necessary conditions are met.

Under normal conditions, some bodies are considered to be more flammable than others, and among these bodies we find hydrogen and carbon, whether they are pure or were, as in most cases, combined: such as hydrogen coals that are widely spread in nature, whether they are of metal origin (oil) or of organic origin (wood, coal, etc.)

Auxiliary combustions: It is the body that aids combustion (the second component of the chemical reaction of combustion). One of the auxiliary bodies for combustion and the most widespread is oxygen, as all combustions generally occur by oxygen and are therefore oxidation processes.

The oxygen itself can be free (21% air or gas) or in combination, such as metallic oxides (iron oxide, magnesium oxide ...).

There are also some materials that are very combustible and have a strong relationship with oxygen or other auxiliary bodies (as they are in normal conditions of heat and pressure, realizing in the air the chemical combustion reaction, such as white phosphorous) and on the contrary, some other bodies cannot unite with the bodies that auxiliary to combustion except if a certain amount of energy is available to start combustion.

- Heat: One of the simplest types of energy aiding combustion, but all types of energy can be transformed and give off heat.

Fire Triangle (Fuel - Heat - Oxygen)

All known types of energy can be heated to initiate ignition:

- Light energy (making lenses)
- Mechanical energy (collision, friction)
- Electric energy of joule: the collision of moving electrons
- Chemical energy of joule: the electrons surrounding the nucleus in the atom
- Atomic energy of joule: electrons and neutrons released by atomic division
- Living Energy: Heat released by fermented living substance

Second: Fire

Fire is a secondary phenomenon of combustion, and it is one that our senses can easily feel.

Each combustion is accompanied by a release of its energy that can appear in the form of mechanical energy (explosion) or thermal energy (heat).

Fire is an evolution of heat and light that result from ignition simultaneously, and this is a physical phenomenon that appears in two forms, flame and glowing coal.

Depending on the composition of the material, the two forms appear together or one after the other:

The ignition of solids releases gases which, under the influence of heat, are released and burned after reaching the point of ignition, forming a flame.

Solids can turn into liquids, and with the effect of increasing temperature, this liquid releases gas that burn in the form of a flame, meaning that a flame is a stream of gas or burning fumes that release light.

Third: Smoke

Smoke is the result of incomplete ignition, as the surrounding flame can generate smoke accompanied by spark, which occurs as a result of the evaporation of the burning object or from the evaporation of water in contact with the flame. The more carbon in the flame is attached to the combustion object, the blacker the flame is, accompanied by intact or partially smoldering coal particles.

Fourth: Changes that occur to bodies during combustion

The rise in temperature resulting from combustion changes the state of bodies from a solid state to a gaseous state, passing through a liquid state, and few objects pass directly from a solid state to a gaseous state (sublimation), and the passage of bodies to a gaseous

state is preceded by the emission of fumes from the surface of the heated body. It is the starting point, in which self-combustion begins (whether the mixture of vapors and air oxygen is compatible), and knowing this heat point for combustion of the mixture is important for firefighting, and therefore a high or low percentage does not lead to the ignition of these vapors, nor can it insure self-combustion of flammable material.

2. Types of fires:

Fires are divided into five categories according to their ignition source:

Class (A) solid material fires: which arise from materials that are based on cellulose (such as wood, textiles, and cardboard) and materials that are based on the formation of the carbon atom.

Category (B) petroleum fires: they originate from flammable petroleum liquids such as gasoline and kerosene.

Category (C) electrical fires: which originate from electricity sources.

Category (D) metal fires: occur in flammable metals (such as magnesium, sodium, and potassium).

Category (H) gas fires: they origin from different flammable gases (such as methane, ethane, butane ... etc.)

3. Foundations of firefighting (extinguishing theory):

The combustion process is that chemical phenomenon that occurs as a result of combining the combustible substance (fuel) with the oxygen by a factor of the influence of a certain temperature for each substance (the ignition point).

That is, the sides of the fire triangle (fuel - oxygen - heat) are the three conditions necessary for ignition. In order for the fire to be ignited properly, a fourth condition can be added, which is the chain reaction what is meant here is the interaction of the three states: fuel, oxygen, and heat, and then the particles of the substance move and ignite.

Heat is transferred in one of the following ways:

- Direct contact: The heat is transferred from non-heated materials upon direct contact, such as touching a burning lamp by hand.
- Load: The heat is transferred from one place to another, carried by a moving method such as wind, fluids and moving torrents.
- Connection: It is transmitted through a medium that conducts heat from one place to another, such as moving a hot cup of tea.

Radiation: The heat is transferred by radiation from the place of heat to the surrounding places. The temperature transmitted by radiation varies according to the distance or proximity of the radiative source of heat such as the sun.

Also, the extinguishing theory depends on creating an imbalance in the balance existing in the sides of the triangle, one of its three sides being excluded or creating an imbalance in the chain reaction (such as reducing the proportion of air or steam, ... etc.), and therefore the foundations of the extinguishing theory can be done by the following means:

- A. Starvation (removing the inflammable substance)
- B. Suffocation (withholding oxygen).
- C. Cooling down (lowering the temperature)

The fourth method in the extinguishing theory is to break the chain reaction in one of the three states (starvation, suffocation, and cooling of matter).

A. Removing the material: Removing the flammable materials that are not caught by the fire from the center of the fire. This concept deals, for example, with unloading the load of railroad cars or transporting the contents of a burning building, removing a burning car from a garage so that the fire does not flow to the rest of the place, unloading the load of a steamer that has caught fire, or creating an empty space in a forest by cutting down trees and herbs to prevent the fire from spreading to stop the flow of fire throughout the place or location in which the fire is located.

B. Blocking of oxygen: preventing or reducing the arrival of air to the burning object when its ignition ceases (due to the absence of the element of oxygen mixed with air, which is approximately one-fifth of its volume) or it is composed of chemical combustion materials, and this blocking process is done by using sand on the fire that is burning on a flat ground or by chemical devices or wrapping a person burning in a blanket, or using foam devices to extinguish petroleum fires, where a layer of foam is formed that blocks the surface of the burning liquid from oxygen in the air, and reducing the percentage of oxygen in the fire area to below the appropriate percentage will lead to extinguishing the fire (shedding the amount of inert gases over the ignition zone).

C. Cooling: Water is the primary means of extinguishing the fire, just as cooling is the most common method in extinguishing operations. If the rate of heat caused by the fire is less than the percentage of heat that is absorbed by many factors of the burning substance, then the ignition stops and extinguishes the fire, and this idea is based on extinguishing the fire by cooling the atmosphere around them faster than the heat created by ignition.

The method of cooling with ventilation is also feasible in some cases. If the temperature in the burning environment decreases to a point less than the ignition temperature of the materials, we find that the fire gradually diminishes.

Among the advantages of using water for extinguishing, we can mention the following:

1. The water temperature rises and is equal to the temperature of the fire
2. The water in contact with the fire turns from a liquid state to a gaseous state, and absorbs a large amount of heat (every gram of evaporated water absorbs 622 calories), which reduces the necessary heat needed to start the combustion of a combustible object.
3. The water used for extinguishing is at a temperature that varies (according to the region and season), this temperature is much lower than the temperature of solid bodies and is in the case of combustion, (from 300 to 1200 degrees), and this percentage is lower than that of highly flammable liquids, especially for gases, of which the degree of combustion is always of low altitude.
4. Water chemically decomposes at high temperatures, and it can chemically react with smoldering objects.
5. Evaporated water increases the rate of heat spread over the heat generated, as practical methods of extinguishing are more effective in cases that work to evaporate the largest amount of water used, due to the positive effect of steam in spoiling the ignition atmosphere, extinguish it as well and expanding its area. The amount of water when it evaporates doubles its volume to 1650 times its volume when it is liquid.

The higher the percentage of water left over from the extinguishing process is less than the percentage of the consumed water, the more it indicates the effectiveness of extinguishing, and you see that the lower the temperature, the water vapor condensates more over the fire, and this phenomenon indicates the proximity of the moments during which the fire is extinguished and the fire is under control rates.

4. General definitions of fires:

First: the ignition point (flash)

It is the temperature at which a sufficient proportion of the vapor of the substance occurs to form a mixture with the oxygen present in the air, after which the ignition begins.

Second: the burning point

It is the lowest temperature at which the burning of a substance continues after its ignition, and the temperature of combustion is a few degrees above the flash point.

Third: The degree of automatic ignition (self-ignition)

The temperature at which the combustible vapor mixture is ignited with air without the need for a spark or flame.

Fourth: the heat of combustion

Heat resulting from combustion of an amount of a fully combustible substance.

Fifth: Flammability

The flammability limit is the maximum concentration of the flammability limits in the oxidizing agent and through it the flame arises and continues to spread at the specified temperature and pressure.

Sixth: Flammable liquid

It is a liquid having a vapor pressure of no more than an absolute 276 kPa at a temperature of 37.8 ° C.

Seventh: Lower ignition limit (L)

A lower ignition limit is a concentration of vapor or gas in the air or oxygen below which no advance to a flame occurs when connected to an ignition source.

Eighth: Upper ignition limit (U)

- The upper limit of ignition of a fuel or gas vapor mixture with air is the limit above which no flame advance occurs if the mixture comes into contact with an ignition source.

The concentration ratio between the lower and upper limits of ignition is called the ignition field.

5. Equipment and materials used in extinguishing fires:

We will study portable and stationary equipment and their materials, as they relate to both personal and preventive use.

5.1 Portable fire extinguishing equipment

It is the portable manual equipment "means of primary control" which are used to fight the fire in its early stages by the ordinary persons present onsite, and the extinguisher must be in conformity with the standard specifications.

Among the generalities of safety are the following:

1. When using the fire extinguisher, the location near the fire must be chosen so that this location is safe to be easy to retreat, when necessary, without trouble or hardship, and it is preferable that it be as close as possible to the doors or other exits, and if the fire is outside the building, the location of the extinguishers must be above wind level.

2. Lowering the person's stature while fighting the fire is considered one of the useful means to avoid the danger of smoke and heat from the fire, as well as facilitating him/her approaching the site of the fire.

3. Attention must be taken that the fire is completely extinguished before leaving the site so that it is not expected to return. Be aware that this type cannot be used to extinguish electrical appliances and equipment fires connected to live electrical currents or oil, grease or metal fires. The water extinguisher works to lower the temperature of the place.

1. Carbon dioxide (B & C) extinguisher

A steel cylinder containing carbon dioxide gas that has been compressed to the point of liquefaction and is used to extinguish fires of oils, greases, dyes, and highly flammable liquids (as the foam extinguisher B) in addition to electrical appliances fires (Class C).

Carbon dioxide creates flames and cools the temperature, it is released at a temperature (76 below zero), the extinguishing agent is weak in the open air, it is dissipated by the wind and makes a strong sound when operating.

2. Dry chemical powder extinguisher (Class D)

A cylinder packed with dry chemical powder and used to extinguish alcohol and petroleum fires, and fires of dyes, flammable materials and metals (magnesium - sodium - potassium) that insulate the surface of the burning material.

A. Technical reasons: such as thermal, mechanical, chemical and electrical reasons

B. Humanitarian reasons: such as lack of caution, indifference, ignorance and error

C. Natural causes: such as the sun, lightning strikes, and sudden combustion

- To prevent fires, the causes of their outbreak should be prevented, such as preventing smoking in prohibited places, placing ash containers, taking measures against electrical sparks, using electrical disconnection devices, replacing worn lines, etc.

All fires are simple and under control at the beginning, and the danger is not at the beginning of the fire but rather depends on the possibility of its extension and expansion.

How does the fire extend?

A. From bottom to top:

That is by means of flames and sparks, and hot air according to the natural law of attraction, as fire, smoke and gases take their direction by means of, for example, vertical attic windows and elevators.

B. sideways: this is by radiation, as any incandescent stove emits radiation that forms the flammable materials that surround it.

C. Conductivity: by simple contact, and this case is represented by an electric iron connected to the electric current and left on top of inflammable objects.

D. By the transfer of gases and vapors: as the flammable gases contained in the smoke sweep over the upper part of the place to accumulate in abundance far from the point of their emission.

8.2 Prevention measures:

1. Check and periodic inspection of workplaces:

The periodic inspection of all work sites, even if all buildings and facilities are properly designed and equipped with fire protection requirements, is one of the most important work of the Occupational Safety and Health Committee.

The inspection must include the following cases:

- Storage operations, especially inflammable materials, auxiliary to combustion materials, or self-igniting materials.
- Sources of sparks and other heat sources.
- Ensuring the availability and safety of fire extinguishers and their suitability for operation.
- Ensuring that general hygiene instructions, collection and disposal of exhausts, etc. are implemented.
- Cleanliness, smoking prevention, carrying matches and lighters, and proper storage.
- Smoking must be strictly prohibited in workplaces where flammable materials are available.
- Placing signs of (No smoking) in areas where smoking is prohibited and implementing these instructions carefully from supervisors, visitors and workers.
- It is prohibited to carry matches and lighters in places where smoking is prohibited.
- Do not store flammable materials in open or glass containers (dry up spills quickly and do not store them near heat sources such as stoves and heaters).
- Always maintain the necessity of not having any papers or debris on roofs, in gardens or around buildings, for ease of use with any spark that touches it.

- Be sure to extinguish matches or cigarette remnants before throwing them into the designated containers.
- Waste should be burned in special incinerators, and not in the open air, especially on windy days, or at a distance of less than 50 meters from the buildings.

2. Taking care of the fire extinguisher

We must know the components of a fire extinguisher, namely:

The extinguisher body: It is the metal body that contains the extinguishing materials.

Hose: The part through which extinguishing materials pass from the extinguisher body to the extrusion nozzle.

(Smaller size extinguishers may not have a hose.)

Safety pin: It is the metal ring for fixing the operating arm, which is designed to prevent the release of extinguishing materials due to the wrong pressure on the operating handle.

Carrying handle: It is the fixed metal part that is used to hold the extinguisher.

Operating handle: It is the moving metal part above the carrying handle, which is the tool for operating the extinguisher and releasing extinguishing materials.

Pressure indicator: It is the part that shows the validity of the extinguisher (the pressure indicator is noted in all standard extinguishers except for the carbon dioxide extinguisher, of which validity is tested by weight or maintenance).

To take care of a fire extinguisher:

1. You must ensure the validity of the fire extinguisher, because it is the loyal companion to protect you from fire the moment it occurs.
2. Watch the indicator on the extinguisher, as well as the weight of the extinguisher for carbon dioxide.
3. Observe the maintenance history on the extinguisher.
4. Contact the specialized company every 6 months to perform preventive maintenance of the extinguisher.
5. Contact the specialized company immediately to refill the fire extinguisher after its use and empty its packaging.

6- Locate your fire extinguishers and place a numbering system for them.

3. Examination of behavior and control instructions:

When a worker discovers that there is a fire outpost in his workplace or residence, he/she must act as follows:

- A. To break the fire alarm glass to turn it on.
2. To call the emergency phone number immediately to summon the fire teams.
3. To fight the fire, if possible, by using the closest extinguisher suitable for the type of fire, and to apply the instructions for use known by him/her and written on the extinguisher label.
4. To make sure that the place where one stands does not pose a danger to him/her and that one can escape if the fire spreads.
5. When using the manual fire extinguisher outdoors, one must stand with the direction of the wind at a distance of two to three meters from the fire.

In the event of exposure to the risk of an outbreak and widespread fire, the worker shall adhere to the following:

Do not try to extinguish the fire unless it is small and you are sure you can put it out.

If the fire is big, leave your room, close the door behind you, and turn on the alarm.

In heavy smoke, rolling onto the ground is the best way to have fresh air.

Feel the door and the handle with the back of your hand. If it is not hot, open cautiously and exit.

If you find the door is hot when touching it, do not open it.

Remove the curtains, open the room to ventilation and expel smoke

2. Visual Indicating Panels

Usually they are installed in an appropriate place approved by the competent fire authority, and each thermal or smoke detector head has an independent circuit connected to a special indicator on part of the panel, so that it is easy to infer the location of the fire. This panel is equipped with a means to test the connections of the system to ensure its safety and validity, and some of these panels are provided with a means to clarify the false alarm resulting from a defect in the system connections.

3. Audible Warning Devices

These devices give audible sounds that can be distinguished, such as the bell, the whistle, the trumpet, and the siren, and the warning sound must be clear and audible within the site or in the specific part of the site where the warning sound is required, according to each case requirements. It may require that the warning be comprehensive within the site. A comprehensive audible warning may not be appropriate in some places that have a special character, such as hospitals and major shops, where sounding the alarm inside them leads to panic among the people who visit the place, and therefore it is required in such places that the sound of the alarm be heard only in the monitoring or guarding room so that only supervisors and specialists can hear it. In such cases, light alarms are installed that give specific signals so that all workers in the place know about the fire, so that each of them takes measures known to him/her and related to the work of combating or evacuating the site in an organized manner.

4. A means of summoning the specialized firefighters:

Provide a suitable connection

Install fire doors

Replace non-fire doors with fire doors

Automatically close doors when a fire occurs

Make ceilings or floors from fire-resistant materials

- The necessary precautions to prevent the spread of fire

(Lining the walls with non-combustible elements and installing fire doors)

- Construction materials for storage places or the use of petroleum liquids or inflammable hazardous materials and liquids (storage sites for these materials - materials from which packages are made - building storage buildings from fire-resistant materials - ventilation devices inside the store).

- Dividing the large space by setting up partitions to reduce its size so that the fire does not spread.

5. Recommendations related to escape routes:

Escape routes are considered vital issues due to their connection to the safety and security of life inside the buildings, so they should be given adequate care and the number of workers in each part of the building must be determined. In light of this, the escape routes that are commensurate with the risk are decided so as to ensure that the workers go out

when a fire occurs to a place where they find security and safety, and the recommendations include the following:

1. The doors open to the outside easy, and it is not allowed to be installed in a way that makes it impossible to open them. It may be required that the doors be left open throughout the work period if the situation so requires (if the activity practiced is very dangerous)
2. Appropriate thresholds and hallways leading to the doors
3. Removing the obstacles that obstruct the exits
4. Clarifying the locations of the exits used as escape routes, with an indication to the way to open the doors.

6. Recommendations related to electric lighting

1. The condition of electrical installations and equipment and their conformity with technical principles shall be decided.
2. Due care should be given to temporary and emergency connections.
3. Recommending to equip the building with safe electrical installations that prevent the occurrence of thermal radiation from lamps or the emission of other thermal effects in places that contain fumes, gases, or inflammable or explosive dust.
4. Recommending the provision of backup lighting, if necessary, especially for the locations of the escape routes.
5. Lighting by mobile (manual) batteries.
6. Providing an easy way to cut off the electrical current, so that it can be easily used when needed.
7. Ensuring that regular maintenance work for electrical installations and equipment is carried out.
8. Fire can be defined as a rapid reaction of a flammable substance with oxygen accompanied by heat and light.

In order for a fire to occur, there must be three main elements combined and it is known as the fire triangle:

1. Flammable substance
2. Oxygen or oxidizing substance

3. Source of heat

Fires cannot start if one of the three preceding elements is missing. Hence, it must be emphasized that flammable substances should be kept away from heat sources.

The sources of combustion are many, including static electricity and flying sparks from some devices, as well as sources of flame and heating.

Fires can be classified into four main types, namely:

Type: The type of substance burned

- A. Common flammable substances such as wood, paper, clothing, rubber, and plastics.
- B. All flammable liquids and gases common in the laboratory.
- C. Electrical appliances and devices such as electric heaters and ovens.
- D. Flammable chemical elements such as sodium and potassium are flammable solid chemicals.

Types of fire extinguishers:

There are some main types of fire extinguishers, and they are classified according to the fire that is used to extinguish it:

1. Carbon dioxide extinguishers: This type of extinguisher is effective for fires of type (B) and (C).

Here, care and caution must be taken when using this type of extinguisher because of the strong thrust coming out of the extinguisher nozzle, which may cause some valuable glass to break. Likewise, these extinguishers should not be used with Type (D) fires.

2. Dry powder extinguishers: These are used for type (B) and (C) fires. These extinguishers are usually filled with inorganic material such as sodium bicarbonate or mono ammonium phosphate under hydrogen pressure, and this type of extinguisher is not suitable for type (A) and (D) fires. Although it can be used with type (C) fires, it is not preferred to use it for this type of fires due to the difficulty of cleaning the internal delicate parts of electrical appliances.

- B. Sand buckets: They are metal buckets usually painted in red and include clean fine sand. Usually, such buckets are distributed all over the laboratory and are characterized by cheap price as they are good for absorbing chemical liquids spilled on the laboratory floor, whether acidic or alkaline.

Common mistakes when fighting fire with manual fire extinguishers:

1. Fighting the fire against the airflow, which reduces the efficiency of the extinguisher and exposes the holder to heat, smoke and extinguishing material.
2. Not directing the projectile to the base of the flame.
3. Starting to throw the extinguishing material before approaching with an effective distance.

- It is recommended to illuminate the illustrative panels of the escape routes, the hospital, and the emergency management in the area.

- **Human Resources (HR)**

Technicians responsible for the firefighting operation must be provided, distributed in shifts and available 24 hours.

8.2 Occupational safety and health measures

Occupational health and safety management and the procedures used onsite are among the most important items that must be taken care of. Since workers are exposed to waste during the repacking and loading, highly qualified and trained workers will be appointed, especially in the issues of occupational health and safety. The following are some of the safety items necessary during handling hazardous waste:

- Workers should use virus-resistant clothing in addition to helmets while at work.
- Use self-contained breathing device onsite for emergency use.
- Use special jumpsuits of high quality that is suitable for dealing with hazardous waste.
- Follow all the instructions mentioned in the chapter on the mitigation measures plan.
- That is, care must be taken and all workers are warned to wear appropriate personal protective equipment.

8.3 Occupational safety and health responsibilities

Responsibilities include:

- Implement industrial safety instructions, preserve the environment and develop programs that achieve safety for the work area and its employees, as well as programs to prevent environmental pollutants.
- Discover risks and damages in the work environment.
- Pass by the various workplaces according to the passing plan drawn up on a special form and write reports resulting from passing.
- Examine serious accidents and notify the industrial security office within 24 hours.
- Investigate a work injury that occurs to workers by making an injury report in order to provide first aid and the required treatment.
- Prepare accurate statistics about work accidents and send them to the industrial security office.
- Make a record of work injuries.

8.4 Staff awareness and training

Workers at all levels will be informed of the following:

- The importance of conforming to the health, security and environmental preservation policy and procedures for environmental management requirements;
- The possibility of environmental impacts resulting from personal mistakes and how to remedy the same;
- Environmental benefits that may occur as a result of good employee behavior; and
- Possible consequences as a result of non-compliance with the executive procedures assigned to them.

6.4 Staff training plan

Training of workers in the field of hazardous waste handling includes the following:

- General Awareness / Informative Training: The purpose of this training is to raise the awareness of workers and technicians of the dangers and nature of this type of hazardous waste and of the requirements of EAA in this regard.
- Safety Training: Safety training aims to provide employees with emergency response information and procedures required to protect the worker from risks, and to address safety procedures, employee responsibilities, and procedures required in the event of a security threat.
- Conduct an intensive training of at least one day by the infection control team on safe methods of dealing with suspicion or infection of Coronavirus (The medical

and non-medical team of the Field Hospital was trained and the nutrition technicians and workers of Queen Service Cleaning Company were trained.

- Nurses are trained on nursing skills in dealing with patients and communication skills.
- A practical experiment should be done without patients before receiving them.

Annex No. (1)
EIA Form for Category (B) Projects

Arab Republic of Egypt

The Cabinet of Ministries

Ministry of State for Environmental Affairs

Egyptian Environmental Affairs Agency

The data of this form shall be filled in by the form provider, provided that it is accurate and in clear handwriting, and the form provider is liable towards the validity of the data, provided that the administrative authority approves it and sends a copy of the form to EEA for review and opinion, and any inspection reports or other additional attachments can be used.

Environmental Impact Assessment - Form (B)

1. General information

1.1 Project Name: Ain Shams University Field Hospital

1.2 Type of the project: (infrastructure - industrial - agricultural - energy - health projects - tourism - other)

Health projects.

1.3 Project address: Inside Ain Shams University.

1.4 Name of the project owner (person - Company - other): Ain Shams University.

1.5 Name of the Official in charge:

Tel. No. Fax:

Email:

Form prepared by:

Tel. No. Fax:

Email:

1.6 The Licensing Authority: The Environmental Affairs Agency (EEA)

1.7 The nature of the project: ☒ new ☐ expansions, type: ____

- If the nature of the project is expansions:

Has the EIA form / study for the main project been submitted? ☐ Yes ☐ No

The date of obtaining the previous approval from the EEA along with attaching the approval:

Attachment No. (1)

The date of obtaining the first license for the project along with attaching the license:

Attachment No. (2)

1.8 Is the project among a wider development (industrial area, tourism center, other)?

☐ Yes ☒ No

If yes, state the name of this development:

- Has an EIA study been prepared for this development?
☐ Yes ☐ No

The date of obtaining the previous approval from EAA along with attaching the approval:

2. Project data:

2.1 The total area of the project (square meters): 4600

The total area of the project buildings (square meters): 4600

2.2 Main Product:

2.3 By-product

2.4 Place and location of the project:

A general description of the project site from all sides must be attached, explaining the site's boundaries in respect of neighboring activities and development, land uses, roads, archaeological areas and nature reserves, if any.

(Please attach a detailed map approved by the competent administrative authority with an appropriate and clear scale, with the direction of prevailing winds clearly indicated on it).

Attachment No. (4)

2.5 The distance between the site and the nearest housing block: _____

2.6 The nature of the area in which the project is located (it can be more than one option):

<input type="checkbox"/> An independent building	<input type="checkbox"/> Topped with housing	<input type="checkbox"/> City
<input type="checkbox"/> Village	<input checked="" type="checkbox"/> Within a residential area	<input type="checkbox"/> Outside a residential area
<input type="checkbox"/> Agricultural area	<input type="checkbox"/> Desert area	<input type="checkbox"/> Industrial area
<input type="checkbox"/> Vocational area	<input type="checkbox"/> Coastal area	<input type="checkbox"/> Natural reserve
<input type="checkbox"/> Archaeological area	<input type="checkbox"/> Other, specify _____	

2.7 General description of the project area:

A description of the natural, biological, social and cultural environment of the project area must be attached.

Attachment No. (5)

2.8 Infrastructure:

Water network	<input checked="" type="checkbox"/> Available	<input type="checkbox"/> Not available
Electricity network	<input checked="" type="checkbox"/> Available	<input type="checkbox"/> Not available
Drainage network	<input checked="" type="checkbox"/> Available	<input type="checkbox"/> Not available
Road / railway network	<input checked="" type="checkbox"/> Available	<input type="checkbox"/> Not available
Fuel sources	<input checked="" type="checkbox"/> Available	<input type="checkbox"/> Not available

2.9 The proposed alternatives to the project site

Mention the proposed alternatives to the site and the reasons for choosing this site (degree of protection from natural hazards and compatibility with development of the surrounding area).

Suggested alternatives to the site: University Hospital in Obour, and the reasons for choosing the current site are as follows:

The project area is suitable and as far away from the population as possible.

3. Description of the project phases:

3.1 Establishment phase:

- Establishment date: May 2020
- Execution schedule: _____

3.1.1 Brief description of activities during the construction phases:

The ground and concrete bases were prepared, and a metal truss was made and insulated to suit the nature of the hospital, final finishes were made for floors and prefabricated walls were installed, the hospital contents were furnished including beds and medical devices, and the hospital was experimentally operated with services (electricity, water, drainage, ventilation).

- Water sources: municipal water - uses: cleaning and sterilization - consumption rate: _____.
- Type of fuel: electric power, diesel - fuel source: the government electricity network, diesel (a company of the General Petroleum Corporation) - Average consumption: _____.
- Expected employment and places of residence: medical and assistance teams, administrators, and cleaning workers = 126

3.1.2 Construction waste and the method of disposal:

- Solid waste: medical waste (gauze - cotton - syringes - ...) - type: hazardous waste - quantity: 150 to 200 kg per day -method of disposal: collection in designated rooms inside double bags (double - triple), then deliver it to a contractor for the Ministry of Health to be executed along with the waste of the government hospitals.
- Liquid waste: sewage and industrial waste - type: hazardous waste - quantity: (250 - 500 liters / per bed daily - method of disposal: the public drainage network after processing.
- Gas emissions (smoke, odor, suspended substances): smoke in the case of diesel operation.
- Noise: Nil
- Other: Nil

3.2 Operation phase

3.2.1 A detailed description of the operation stage (figures or illustrations are attached):

- The main components of the project:

-
- Water sources (public/ underground/ water bodies/ ...): municipal water.
Consumption rate (m^3/day): 62 cubic meters / day.
 - Type and sources of fuel: electric power – diesel
Consumption rate: _____
 - The used motive energy: electrical energy, diesel - source: the government electricity network, diesel (one of the companies of the General Petroleum Corporation)
 - Attach a description of the activities and operations for each component of the project, supported by illustrations of the sequence of activities and operation maps with an explanation of the inputs and outputs for each component and their quantities:
Attachment No. (3)

The alternatives taken into consideration of the inputs used, technology, design or distribution of activities, etc.

Using an electronic program to record data and prepare patient records

Using an electronic program to record data and prepare employee and worker records

Using an electronic program to record data and prepare records for medical teams

Expected employment and place of residence: 126 workers

3.2.2 Waste, its processing and disposal method:

- Air pollutants:

Emission rate of gaseous pollutants (when operating with diesel): $(2400) \text{ m}^3/\text{hour}$

Description of processing gaseous emissions and expected standards after processing:
Nil.

Please attach the expected analysis of gas emissions compared to the limits stated in Law No. 4 of 1994..

Attachment No. (5)

- Liquid waste:
Sewage

Sewage rate: (55) m³ / day

Disposal method: (public network, sewage pipes, other):

The public drainage network.

In the case of a drainage processing unit:

Please attach a description of the unit components, indicating how the sludge is disposed of, the method of disposal of sewage after processing, and the parameters of the drainage produced by the processing unit.

Industrial drainage: _____

Drainage rate: (5) m³ / day

Expected analysis of industrial drainage:

The sediments are collected in dedicated carts to be transported to the drainage waste.

Ways to get rid of drainage:

- ☐ Discharged to the municipal network directly.
- ☐ Collected in drainage pipes without processing and is scraped.
- ☐ Discharged to a water body, mention the name of the water body: _____
- ✓ Others: It is discharged after processing to the public sewage network.

In the case of an industrial drainage processing unit:

Kindly attach a description of the unit components with an indication of the chemicals used, the method of disposal of drainage after processing, and the standards of drainage produced by the processing unit.

- Solid and hazardous waste:

Types of waste generated and the rate of generation: Solid and hazardous waste consisting of medical supplies such as gauze, cotton, medical syringes, and others.

Generation rate is (0.5 - 1.5) kg per bed daily.

- Methods of transportation, handling and storage:

Collection in designated rooms in double bags (double - triple) to be delivered to a Ministry of Health contractor, and executed with government hospital waste.

Waste disposal methods (contractor - safe landfill - others): contractor.

- Work environment

Work environment indicators: _____

Ways to protect workers (safety devices, gas suction systems, etc.):

Protective tools: the use of N95 filters and protective clothing against epidemics.

- Others: _____

-

4. Applicable laws and legislations:

Attach a list of the environmental laws applicable to the project, specifying the aspects set out by the legislation and the number of articles.

Attachment No. (2)

5. Environmental impact assessment (EIA)

Attach an analysis of the potential environmental impacts of the project in both the construction and operation phases, which may include impacts on air quality, soil, surface and ground water, biological environment, social life, infrastructure, neighboring activities, etc., depending on the nature and location of the project, with impacts during emergencies, like spills and leaks.

The potential impacts of the environment on the project (such as earthquakes, torrents, earlier use of the project site and neighboring activities, etc.) must be attached.

Attachment No. (5)

6. Environmental management plan to mitigate environmental impacts:

4.1 Summary of environmental impacts: hospital cleaning and sterilization operations, nursing and medical procedures, medical gas use, drug use and storage, earthquakes and torrents.

4.2 Description of the mitigation measures for each impact:

The impact of earthquakes: partitions are placed among the buildings to protect the buildings from earthquakes, and partitions are created inside the drug stores

The impact of torrents: An infrastructure is created to be directed towards the drainage network to absorb torrents and rains.

4.3 Description of the environmental monitoring program:

Sewage, industrial and solid waste are monitored according to the applicable laws.

4.4 Description of the institutional requirements (specifying responsibilities, requirements and arrangements for implementing mitigation and monitoring procedures):

Determining the responsibilities of each department in the engineering management: technicians responsible for (drainage, processing, ventilation, air conditioning, and all hazardous and solid waste).

6. Attachments

Kindly complete the following table showing the list of attachments, along with attaching the required documents with a justifiable the reason for not being attached. (Other attachments can be added as needed).

S.	Attachment description	Is it attached (yes/no)	Explanations for not attaching
1	Approval of EEAA to assess the environmental impact of the original project (in case of expansions).	–	–
2	Copy of the license for the project (in case of expansions).	–	–
3	The approval of EEAA to assess the environmental impact of development (in the event that a project takes place in a broader development).	–	–
4	General description of the project site with a map at a suitable scale.	Yes	
5	General description of the project area.	Yes	
6	A description of the project activities, attached therewith illustrations.	Yes	
7	Anticipated analyzes of gas emissions.	Yes	
8	Specifications of drainage and / or industrial waste processing unit	Yes	
9	List of environmental laws and legislations	Yes	
10	Environmental Impact Assessment (EIA)	Yes	

Acknowledgment by the form provider

I, the undersigned, acknowledge that the above data is true and correct, and that in case of any amendments to the information received, the EEAA will be notified immediately by the licensing authority.

Project Owner Name:

Name of the responsible person:

Tel. /Fax and address:

Date:

Data to be filled out by the competent administrative authority or licensing authority

Approval of the administrative authority:

Name:

position:

Signature:

Seal of the emblem of the Republic:

**Arab Republic of Egypt
The Cabinet of Ministries
Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency**

General instructions for completing the EIA form:

- Environmental Impact Assessment Form (B) is for projects that fall under List (B).
- All form data are completed accurately and in clear handwriting, with maps and data required for project review.
- The completed form shall be submitted to the representative of the competent administrative authority for approval and sent to EAA after reviewing it and stamping it with the seal of the Republic's emblem.
- EAA reviews the form and expresses an opinion on it from the environmental point of view only and notifies the competent administrative authority of its opinion and the required conditions (approval, rejection or completion of data, ...etc.) within a maximum period of 30 days from the date of receiving it.
- In the event that the project is rejected, the project owner has the right to appeal the decision and submit its grievance in writing to the permanent review committee of EAA within 30 days from the date of its notification.
- All environmental conditions stipulated in the EAA decision for each project are complied with, and inspected to ensure the extent of the project's compliance with environmental law and conditions.
- This form is distributed free of charge and without fees.

Annex No. 2
Environmental Record of Health Facilities

A record form for the health facility activity impact on the environment
(Record of the environmental status of health facilities)
The period of time covered by the environmental record data is from //20__ until/
/20__

First: General data on the health facility:

1. Name of the facility
2. The date of establishment of the facility
3. Address
4. Phone
5. Fax
6. Date of the last renovations
7. Name of the manager
8. Name of the occupational and environmental health and safety official
9. Name of the infection control official
10. Name of the official in charge of cleaning and waste management
11. Name of the engineering affairs (management) official
12. Name of the record clerk
13. Function of the record clerk
14. Total number of employees
15. Qualitative number of workers

Physicians:

Nursing:

Technicians:

Workers:

Employees:

➤ **Second: Description of the different activities of the health facility:**

Workload (average number of cases per day):

Outpatient clinic : ()
 Departments of general and private surgery : ()
 Laboratories : ()
 Fevers and infectious diseases : ()
 Other diagnostic methods : ()
 Other activities (kindly mention it) : ()

Departments of the general and special internal medicine : ()
 Obstetrics and Gynecology : ()
 Diagnostic Radiation : ()
 Cases of rottenness (SEPSIS) : ()
 Teaching / training : ()

- A list of the various departments of the facility and their locations:

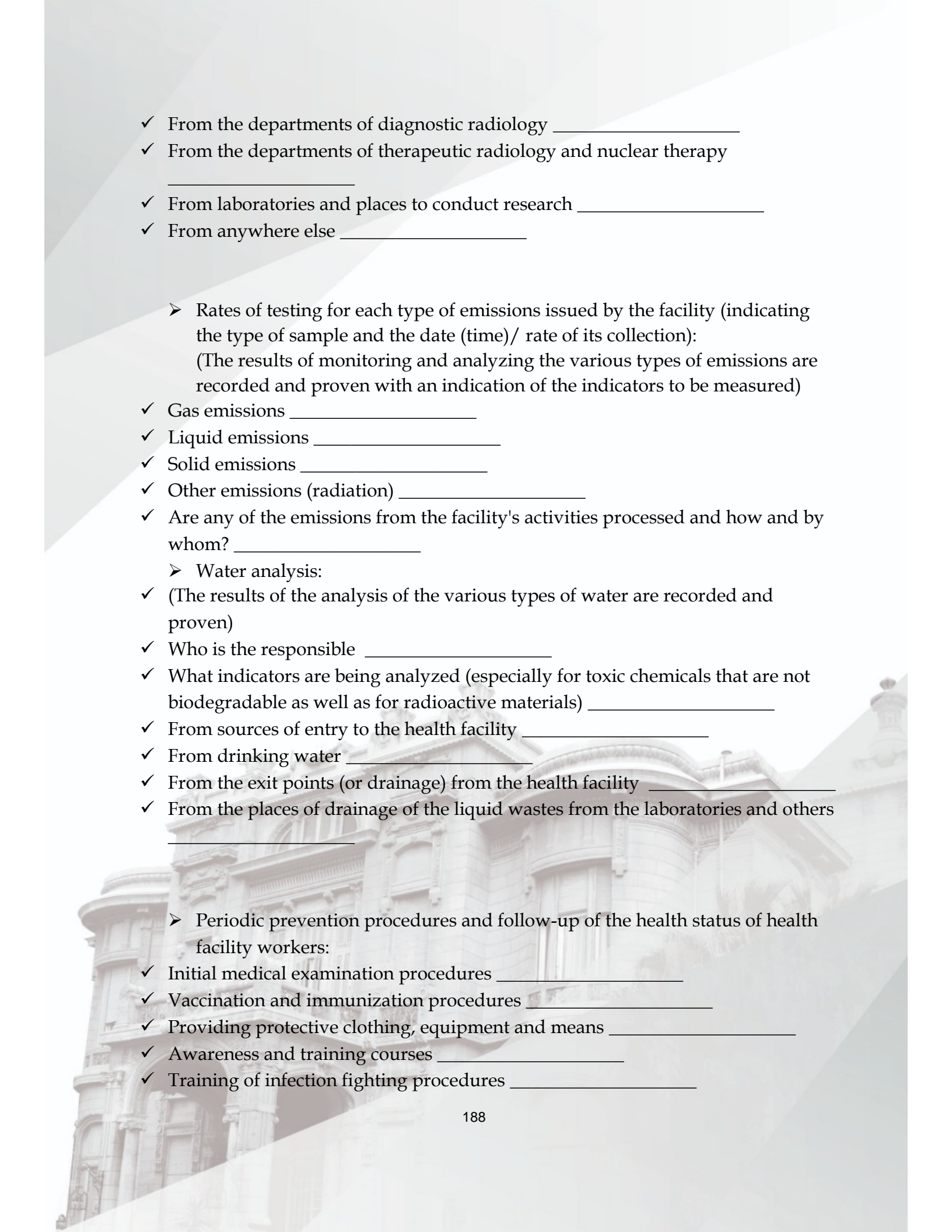
Number	Department	Place (building - floor)

Third: Sources of environmental pollution arising from health facility activities:

- Are there special conditions issued by EAA _____
- Pharmaceutical and laboratory chemicals for cleaning, disinfection and sterilization services and anesthesia chemicals _____
- Ionizing radiation and non-ionizing radiation _____
- Heat and coolness (with or without moisture) _____
- Noises and vibrations _____
- Polluted water _____
- Hazardous waste (infectious - nurse - pathological - syringe needles and sharp material -...etc.) _____
- Others (of whatever type)

Fourth: Procedures for preserving the environment inside and outside the health facility:

- ✓ Monitor the different types of emissions and their rates (per hour/ day/ month/ year) and their drainage rates:
- ✓ From the departments of surgeries, emergencies and accidents (especially anesthetic gases and the causes and factors of infection) _____
- ✓ From patients' wards and places to provide treatment (especially the causes and factors of infection) _____
- ✓ From the pharmacy, sterilization places, and stores of various chemicals (various emissions) _____
- ✓ From chimneys, kitchen, sink and boiler station (various emissions) _____
- ✓ From collection, incineration or processing of waste places (emissions and causes and factors of infection) _____
- ✓ From laboratories, blood bank, morgue, and similar places (emissions and causes and factors of infection) _____
- ✓ From workshops and places of all kinds of maintenance (various emissions) _____
- ✓ From anywhere else (emissions and causes and infectious agents) _____
- Monitoring various radiations:

- 
- ✓ From the departments of diagnostic radiology _____
 - ✓ From the departments of therapeutic radiology and nuclear therapy _____
 - ✓ From laboratories and places to conduct research _____
 - ✓ From anywhere else _____
 - Rates of testing for each type of emissions issued by the facility (indicating the type of sample and the date (time)/ rate of its collection):
(The results of monitoring and analyzing the various types of emissions are recorded and proven with an indication of the indicators to be measured)
 - ✓ Gas emissions _____
 - ✓ Liquid emissions _____
 - ✓ Solid emissions _____
 - ✓ Other emissions (radiation) _____
 - ✓ Are any of the emissions from the facility's activities processed and how and by whom? _____
 - Water analysis:
 - ✓ (The results of the analysis of the various types of water are recorded and proven)
 - ✓ Who is the responsible _____
 - ✓ What indicators are being analyzed (especially for toxic chemicals that are not biodegradable as well as for radioactive materials) _____
 - ✓ From sources of entry to the health facility _____
 - ✓ From drinking water _____
 - ✓ From the exit points (or drainage) from the health facility _____
 - ✓ From the places of drainage of the liquid wastes from the laboratories and others _____
 - Periodic prevention procedures and follow-up of the health status of health facility workers:
 - ✓ Initial medical examination procedures _____
 - ✓ Vaccination and immunization procedures _____
 - ✓ Providing protective clothing, equipment and means _____
 - ✓ Awareness and training courses _____
 - ✓ Training of infection fighting procedures _____

- ✓ Allocating places for smokers and prohibiting smoking in other places _____
- ✓ Any other procedures / remarks _____

Fifth: Procedures for monitoring waste inside and outside the health facility:

- Gas emissions - boilers - incinerators:
- ✓ Characterization of gas emissions (from each chimney - if any) _____
- ✓ The name of the production unit from which the emissions are generated _____
- ✓ Chimney characterization _____
- ✓ The height of the chimney _____
- ✓ The type of fuel used _____
- ✓ Chimney emission rate (m³/year) _____

Number	Pollutant	Pollutant concentration (mg/m ³)	Limits of the law	Pollutant load (tons/year)

- ✓ Principles for determining emissions (estimated - physical balance - emission factor - individual measurements - continuous monitoring of the productive process indicator at operating time - continuous monitoring of emissions) _____
- ✓ The name of the production unit connected to the processing equipment _____
- ✓ Type of processing equipment _____
- ✓ Description of the processing equipment _____
- ✓ Processing plant design efficiency (%) _____
- ✓ Actual efficiency of processing plant (%) _____
- ✓ Pollution before and after processing:

Pollutant concentration before processing (mg/m ³)	Pollutant concentration after processing (mg/m ³)	Pollutant load before processing (ton/ year)	Pollutant load after processing (ton/ year)

- Liquid waste:

- ✓ Characterization of drainage water from each production unit (the amount of wastewater from the production unit m³/day) _____

Number	Pollutant	Pollutant concentration (mg/L)	Pollutant load (ton/year)

- ✓ Attach maps showing the path of the industrial drainage networks

- ✓ Units connected to industrial drainage processing equipment (if any)

- ✓ Processing type (primary - secondary - advanced) _____
- ✓ The designed capacity of the processing plant (m³/hour) _____
- ✓ Description of the processing plant equipment _____
- ✓ Description of processing methods for sludge (if any) _____
- ✓ Disposal method of the sludge _____
- ✓ Pollutant loads:

Number	Pollutant	Pollutant concentration of incoming water	Pollutant concentration of outgoing water

- ✓ Processing plant design efficiency (%) _____
- ✓ Actual efficiency of processing plant (%) _____
- ✓ A statistical summary of the drainage by the place of disposal and the points of drainage after processing, if any:

Number	Pollutant	Pollutant concentration (mg/L)	Limits of the law	Pollutant load (ton/year)

- Solid waste (for each production unit):

- ✓ The name of the productive unit _____

Type of solid waste	Amount of solid waste (ton/year)	Volume of solid waste (m ³ /year)	Remarks
paper			
Plastic			
glass			

Wood			
Organic materials			
Minerals			
Other (mention)			

- ✓ Methods for disposal of solid waste _____
- ✓ Total solid waste at the health facility level _____

Type of solid waste	Amount of solid waste (ton/year)	Volume of solid waste (m³/year)	Notes
Paper			
Plastic			
Glass			
Wood			
Organic materials			
Minerals			
Other (mention)			

Elements of assessment for some departments of special nature
Radiology Departments

- Technicians have licenses to practice the profession _____
- Devices operating licenses _____
- Performing devices calibration:
 - ✓ By: _____
 - ✓ periodically _____
- Maintenance of devices and equipment _____
- Storing radioactive materials in a standardized manner _____
- The case of armor and lead linings in walls, floors and doors (others, mention) _____
- Periodic monitoring of devices and equipment _____
- Periodic examination of the workers _____
- Potentials for infection from:
 - ✓ Syringes and their needles _____
 - ✓ Blood and its derivatives _____
 - ✓ Injuries _____
- The availability of protective clothing and equipment for workers _____
- How to perform hygiene, disinfection and sterilization procedures _____
- How to monitor work environment pollutants _____
- Having a mechanism to monitor anesthetic gases or any other gases, steams, or smokes _____

The department's infection control activities

First: hygiene and disinfection

- Take periodic samples from different places _____
- Availability of adequate types and quantities of cleaning and disinfection materials _____
- A system that shows how to deal with the secretions of sick patients _____
- Existence of a system for dealing with injuries and fractures _____
- Other remarks on hygiene and disinfection activities _____

Second: sterilization activities

- Sterilization methods used and periodic use:

(Sterilization methods used - periodic sterilization required – application of sterilization test)

- ✓ Steam (autoclave) _____
- ✓ With non-ionizing radiation _____
- ✓ in another way _____
- Available sterilizers devices:
 - ✓ Central like _____
 - ✓ Local in departments like _____
 - Other remarks on sterilization activities _____

Third: Management of waste and hazardous materials in the department during the assessment period:

- Number of people in charge of collecting waste in the facility:

Total number ()

Permanent ()

Temporary ()

- How is normal waste collected and packed:

Plastic bags ()

Cartons and boxes ()

Plastic containers without cover () Plastic containers with cover ()

Barrels ()

Buckets ()

Other (mention) () _____

Special containers () With normal wastes ()

Other (mention) ()

- Waste transfer outside the department:
 - ✓ Who is carrying out the transfer _____
 - ✓ What is the transportation method _____
- Is it separated or processed to reuse any of the wastes inside or outside the department:

Number	Waste type	The process (separation and processing)	How (method)	Reason of separation/ processing	Selling/ burning/ recycling/ other

- The existence of a place designated for the temporary storage of waste in the facility until it is transferred outside the facility

Yes () No ()

- Storage location specifications:

Uncovered () covered ()

Length () Width ()

Height ()

- ✓ The location of the storage location to the facility _____
- ✓ Are there any preparations for the storage place (mention) _____
- Other remarks on hazardous waste management activities _____
- Hazardous materials management:

Number	Hazardous material	Quantity	Field of use	Storage method	Disposal of hazardous packages	The packages conform to the specifications	The presence of safety and security data for materials

- Other remarks on hazardous materials management activities _____

Departments of _____

- Potentials for infection from:
 - ✓ Syringes and their needles _____
 - ✓ Blood and its derivatives _____
 - ✓ Injuries _____
- The availability of protective clothing and equipment for workers _____
- How to perform hygiene, disinfection and sterilization procedures _____
- How to monitor work environment pollutants _____
- Having a mechanism to monitor anesthetic gases or any other gases, steams, or smokes _____

The department's infection fighting activities

First: hygiene and disinfection

- Taking periodic samples from different places _____

- Availability of adequate types and quantities of cleaning and disinfection materials _____
- A system that shows how to deal with the secretions of sick patients _____
- Existence of a system for dealing with injuries and fractures _____
- Other remarks on hygiene and disinfection activities _____

Second: sterilization activities

- Sterilization methods used and their periodic use:

(Sterilization methods used - periodic sterilization required – application of sterilization test)

- ✓ Steam (autoclave) _____
- ✓ With non-ionizing radiation _____
- ✓ Hemodialysis department _____
- ✓ Any other departments _____

Kitchen departments

- The availability of protective clothing and equipment for workers _____
- Technicians have licenses to practice the profession _____
- Periodic examination of the workers _____
- How to perform hygiene, disinfection and sterilization procedures _____
- How to monitor work environment pollutants _____

The department's infection fighting activities

Hygiene and disinfection

- Taking periodic samples from different places _____
- Availability of adequate types and quantities of cleaning and disinfection materials _____
- Other remarks on hygiene and disinfection activities _____

Laundries sections

- The availability of protective clothing and equipment for workers _____
- Periodic examination for the workers _____
- How to perform hygiene, disinfection and sterilization procedures _____

- How to monitor work environment pollutants _____

The department's infection control activities

Hygiene and disinfection

- Taking periodic samples from different places _____
- Availability of adequate types and quantities of cleaning and disinfection materials _____
- Other remarks on hygiene and disinfection activities _____

Elevator departments

- The availability of protective clothing and equipment for workers _____
- Technicians have licenses to practice the profession _____
- Devices operating licenses _____
- Maintenance of devices and equipment _____
- Periodic examination of the workers _____

The department's infection fighting activities

Hygiene and disinfection

- Taking periodic samples from different places _____
- Availability of adequate types and quantities of cleaning and disinfection materials _____
- Other remarks on hygiene and disinfection activities _____

Annex (3)
Consultant certificates

Presidency of the Cabinet
Ministry of State for
Environmental Affairs
Environmental Affairs Agency

Registration and Approval Certificate
Environmental Consultant

The Environmental Affairs Agency certifies that Dr. Noha Samir Mohamed Ibrahim Donia has been registered and approved as an environmental consultant in the field of: Self-Monitoring of Facilities and Management of Monitoring Networks.

This is based on the decision of the Supreme Committee for Registration and Endorsement dated 31.8.2017,

Pursuant to the provisions of Article (13 bis.) of Law No. 4 of 1994, as amended by Law No. 9 of 2009 regarding the Protection of the Environment, and its executive regulations amended by Resolution No. 1095 of 2011.

This certificate is valid for five years, starting from 31.8.2017 until 30.8.2022.

Registration No. 134/31/8/2017

Chief Executive Officer
Head of the Technical Secretariat for the
Supreme Committee for Registration and
Endorsement
/Signed/

Minister of State for Environmental
Affairs
The Supreme Committee for Registration
and Endorsement
Prof. Dr. Khaled Mohamed Fahmy
Minister of Environment
/Signed/

/Seal of EAA, Presidency of the Cabinet/

Ministry of Environment
Environmental Affairs Agency

Registration and Approval Certificate
Environmental Consultant

The Environmental Affairs Agency certifies that Mrs. Hoda Ibrahim Ahmed Hilal has been registered and approved as an environmental consultant in the field of:

Environmental Economics and Environmental Accounting

This is based on the decision of the Supreme Committee for Registration and Endorsement dated 23.10.2018 under Article (13 bis.) of Law No. 4 of 1994, as amended by Law No. 9 of 2009 regarding the Protection of the Environment, and its executive regulations amended by Resolution No. 1095 of 2011.

This certificate is valid for five years, starting from 23.10.2018 until 22.10.2023.

Registration No. 269/23/10/2018

This certificate is considered null and void if the license is suspended for any legal reason.

Chief Executive Officer
Head of the Technical Secretariat for the
Supreme Committee for Registration and
Endorsement
/Signed/

Minister of Environment
Head of the Supreme Committee for
Registration and Endorsement
/Signed/

/Seal of EAA, Presidency of the Cabinet/

Sustainability Retrofit Report for

Institute of Environmental Studies and Research Building, Ain Shams University



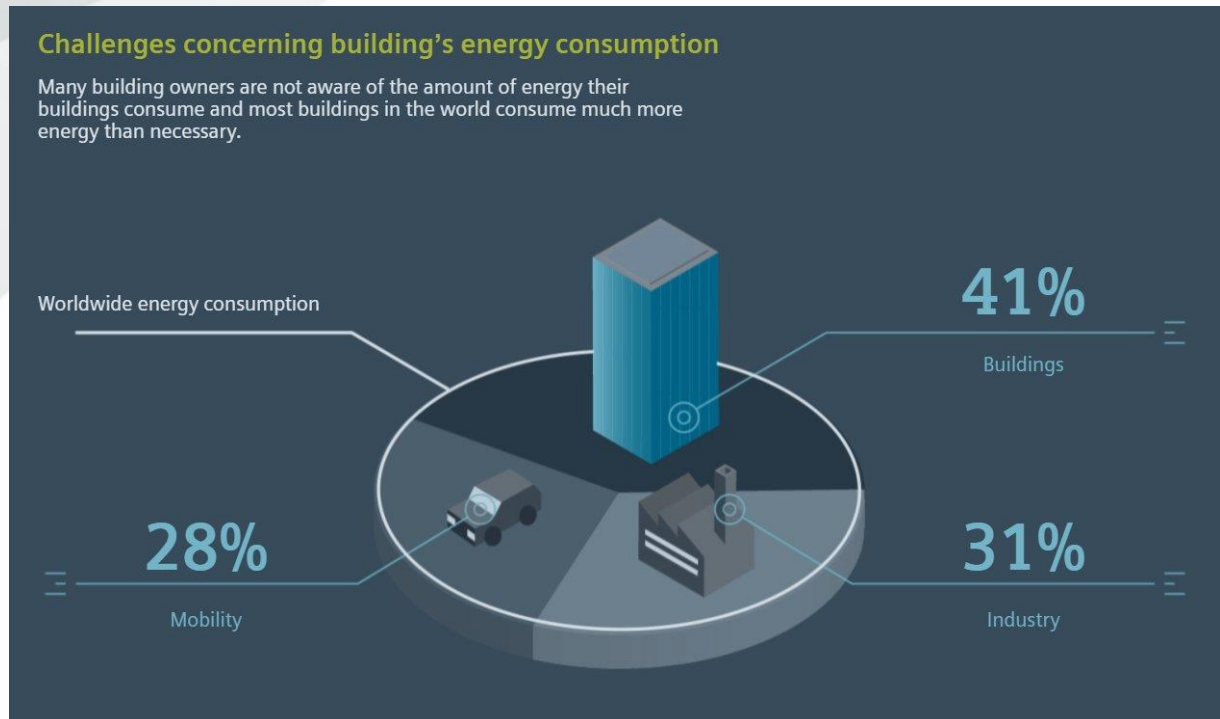
Prof Dr Noha Donia

Dean institute of Environmental studies and Researches

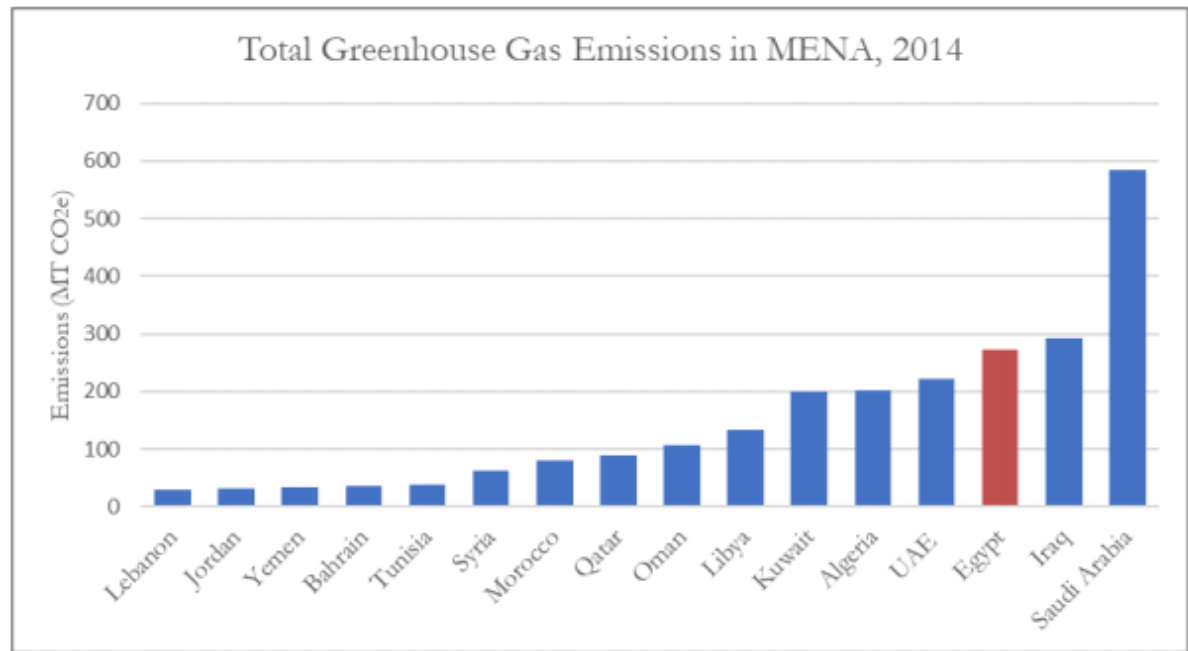
I. Introduction

Buildings contribute to 41% from the total energy use globally.

Reference: International Energy Agency (IEA).



In Egypt, Electricity prices changed from 4.58 to 16 L.E in 5 years, and carbon emissions increase according to the graph below:



-Egypt's total greenhouse gas (GHG) emissions were approximately 272 million MT CO₂e, as per the latest data of the Climate Data Explorer in 2014. Egypt's GHG emissions are considered the third highest out of all countries in the MENA region behind Saudi Arabia and Iraq, respectively (CAIT 2015). More than 40% of Egypt's GHG emissions come from just two sectors: power generation and road transport. By 2030, it is predicted that national emissions will have more than doubled current levels and will increase at a faster pace than population growth (EEAA 2012).

-The Central Agency for Public Mobilization and Statistics (CAPMAS) has reported a rise in Egypt's carbon dioxide emissions resulting from petroleum products and natural gas consumption. CAPMAS said emissions for 2016/2017 were 210 million tons, compared with 206.2 million tons in 2015/2016, making an increase of 1.8 percent.

-According to the CAPMAS statement, the biggest single source of carbon dioxide emissions in Egypt is the electricity sector, which is a large consumer of petroleum products, accounting for 43.3 percent of the nation's total CO₂ emissions during 2016/2017. The other major contributors were: the transport sector, with 18.5 percent; the industrial sector, with 15.4 percent; and the domestic and trade sectors with 8.2 percent.

Water prices in Egypt also increased from 0.94 to 3.40 L. E for m³ of water according to Egyptian company for water and waste water.

The subject building within this report is the Institute of Environmental Studies and Research Building at Ain Shams University; hence, it must act as a role model in terms of building's performance and environmental impact.

From this point, an initiative to evaluate building's current performance did evolve, in an attempt to analyze potential sustainability measures, which are expected to maximize the

saving in energy and water costs, enhance building's indoor environment, and consequently play a **leading role** for the rest of Ain Shams University buildings to follow.

II. Building Narrative

The Institute of Environmental Studies and research, Ain Shams University, is a graduate institute that grants diploma degrees and the Institute of Environmental Studies and research, Ain Shams University, is a graduate institute that awards Diploma, Master's and doctoral degrees in the field of Environmental Science.

Departments of the Institute

The institute includes 7 scientific departments:

- Department of Environmental Engineering.
- * Department of Educational Sciences and Environmental Media.
- * Department of basic and Environmental Sciences.
- * Department of medical and Environmental Sciences.
- Department of agricultural and Environmental Sciences.
- * Department of Humanities and Environmental Sciences

Lecture halls

The institute has (8) classrooms with an area of 6.37 m² for each hall accommodating each hall number (20) chairs

- The capacity of the classrooms is 200 students

- Interactive whiteboard is available in the Hall)
- Openings in the halls with an area of 4.5 M2
- The halls and the building as a whole are connected to a permanent source of electricity
- There's a teacher's table.
- Number of (8) halls with (8) data show and number of (5) transparent projector
- Student area 1.54 M2
- Student intake ratio 56%
- Ratio of openings for floors 11,9%
- Electrical source for permanent building 950 Kva and attached to the building 500 KVA generator
- The halls have displays and a connection to the International Information Network

The institute has (5) discussion rooms

- Each hall is equipped with a fixed data show, a computer, a moving screen, an audio system, and air conditioners are used for ventilation
- Each hall has between 37 chairs to 64 chairs depending on the area of the Hall

Coefficient

Status quo

- The institute has a number of (9) laboratories, (8) laboratories for the practical sections and a number of (1) laboratories for the theoretical section.
- The laboratory area is 37 m2 and the floor opening area is 12.2% and is equipped with marble tables with a surface area of 12 m2 and equipped with cabinets to save materials and equipment
- Laboratory ventilation depends on industrial ventilation through air conditioning for some laboratories and mirrors for others
- The lab has a fire alarm system.
- The scientific laboratory can accommodate up to 7 students per laboratory
- Available space for graduate students in the research laboratory 37 M2 / 7=5.1 M2 / student for Theory number of (9) students ratio $37/9=4.1$ M2
- The ratio of the intake of scientific laboratories $8 \times 7 = 56$ students ratio = $56/353=15.9\%$

Library

- The total area of the library is 175.0 m² and has 65 seats and 2 computers
- Library with tables
- The library is equipped with (1) photocopier inside the library
- There are also 2 cameras in the photography center serving the library
- The library system is based on the eye shelves and contains a large number of references for each specialized topic and a number of dictionaries and dictionaries as there are currently specialized periodicals
- The library has an international information network connection service
- The library has windows of 18.75 m allowing natural ventilation and natural lighting
- Reading area for each student $174/65=2.7$ m²
- Total capacity ratio = $65/252=18.4\%$

III. Current Situation

3.1 Building Enclosure

3.1.1 Roof

i. General Condition

According to the figure below:

Roof number 1 is 60 m² and it is covered by tiles.

Roof number 2 is 73 m² and it is covered by tiles then artificial grass.

Roof number 3 is 420 m² and it is covered by tiles.

1,2 are roofs of some offices and 3 is the main educational hall roof.



Photo 3.1.1.1 Roof number 1



Photo 3.1.1.2 Roof number {1,2}



Photo 3.1.1.3 Roof number 3

- ii. Assembly / Cross-section
The roof material is reinforced concrete without insulation.
- iii. Thermal Insulation
Not exist
- iv. Solar Reflectance
For 1,2 This Area is shaded all day from sunrise to 3PM due to the surrounding buildings.
For 3(the main hall), white color is used to increase the solar reflectance
There is a need for water insulation for 1,2 due to rainwater existed at the electricity duct of the office.
- v. Available Equipment on Roof
There is no equipment on roof.

3.1.2 Walls

i. General Condition



Photo 3.1.2.1 internal walls



Photo 3.1.2.2 Corridor walls



Photo 3.1.2.3 Computer lab walls

ii. Assembly / Cross-section

All external and internal walls consist of hollow concrete blocks that helps with reflecting the heat due to its light weight and the voids.

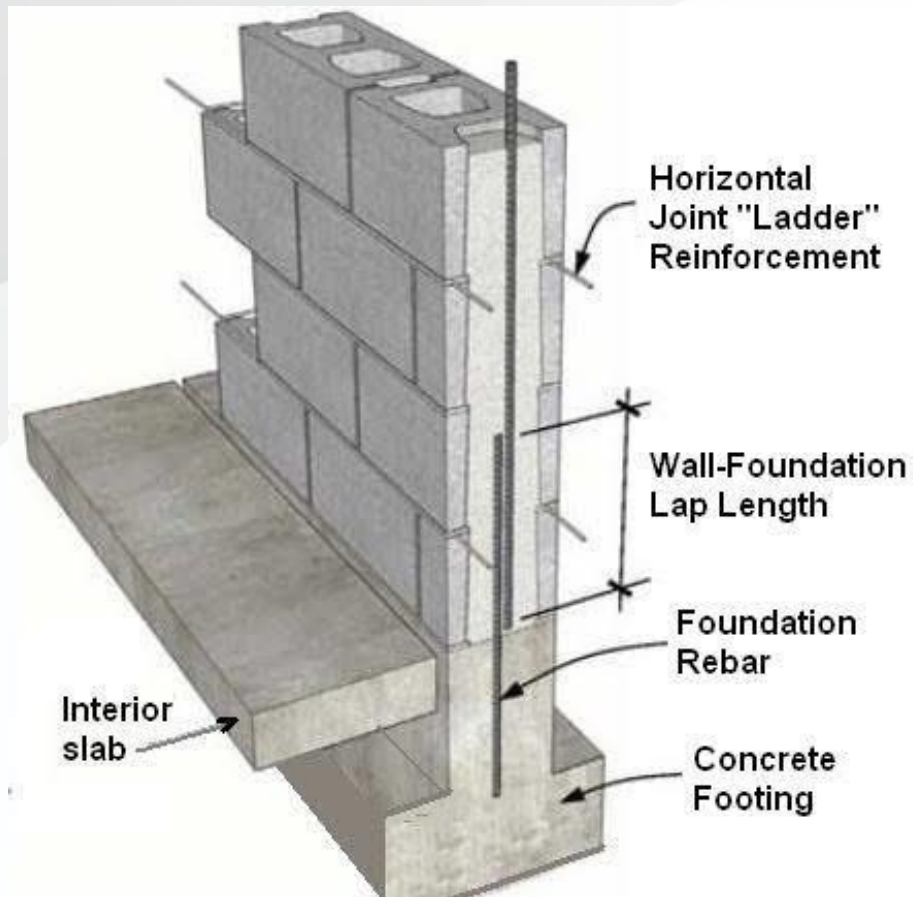
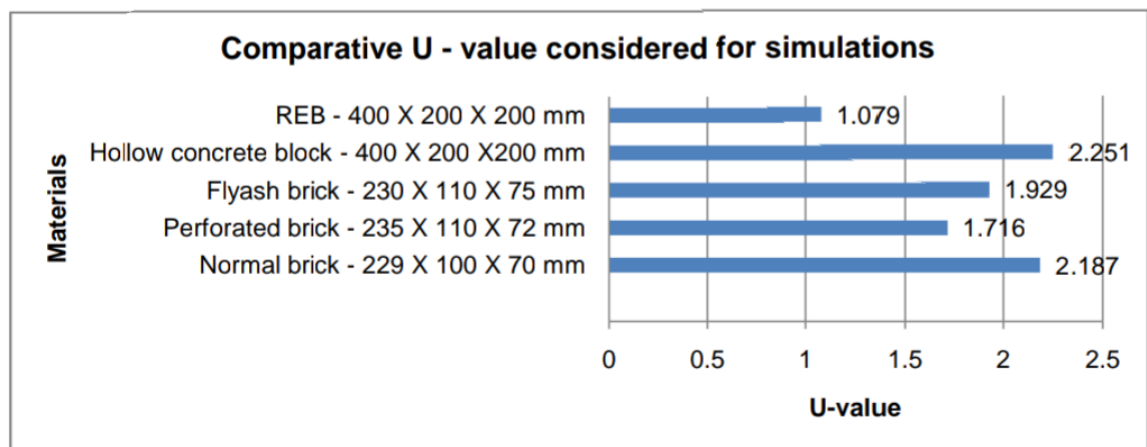


Photo 3.1.2.4 Walls cross-section.

- iii. Estimated U-value
U- value for hollow concrete blocks.



Graph 1: U values of alternative wall assemblies from design builder software.

3.1.3 Fenestration / Windows

i. General Condition

Each space in the building has an access to a window, so natural ventilation and daylight are available, however, daylight and ventilation aren't sufficient for some zones, as smell was observed, and some spaces like the library used electric lighting during daytime.=-



Photo3.1.3.1 Fenestration in corridors.



Photo3.1.3.2 Daylight through building spaces.



Photo3.1.3.3 Mixed use in library (Daylight & Artificial light) .



Photo3.1.3.4 Computer lab access to daylight.



Photo3.1.3.5. Example of spaces that have poor daylight.



Photo3.1.3.6 Large windows enter daylight to each floor.



Photo3.1.3.7 offices daylight.





Photo3.1.3.8. Daylight through building corridor.

ii. Window to wall ratio

It exceeds 40%, So its an acceptable ratio to enter enough daylight to offices. But not all spaces have an access to windows, such as corridors, other spaces used electrical lighting during daytime.

iii. Air-tightness

There is a need for a periodic maintenance of windows air tightness to make sure that is no leakage like photos below (rubber erosion).



iv. Estimated U-value and SHGC

Windows that used is single clear glazed and its detailed below :

Single Glazed

- 4mm Clear – U-value 6.35 – SHGC .65
- 5mm Grey Tint – U-value 6.25 – SHGC .52
- 4mm Evantage – U-value 5.0 – SHGC .54
- 6.38mm Clear Comfort Plus – U-value 5.0 – SHGC .40

3.2 HVAC System

i. Available Method(s) of ventilation

- a. (If any ducts are there or they use only operable windows for ventilation?
There are no ducts for ventilation, almost spaces have from 1 to 2 windows that allows enough air to filter the internal air.
- b. Do all spaces have operable windows?
All offices have an access to an operable window and there are other spaces haven't, such as corridors.
- c. Are operable windows sufficient as per ASHRAE 62.1 code?
**

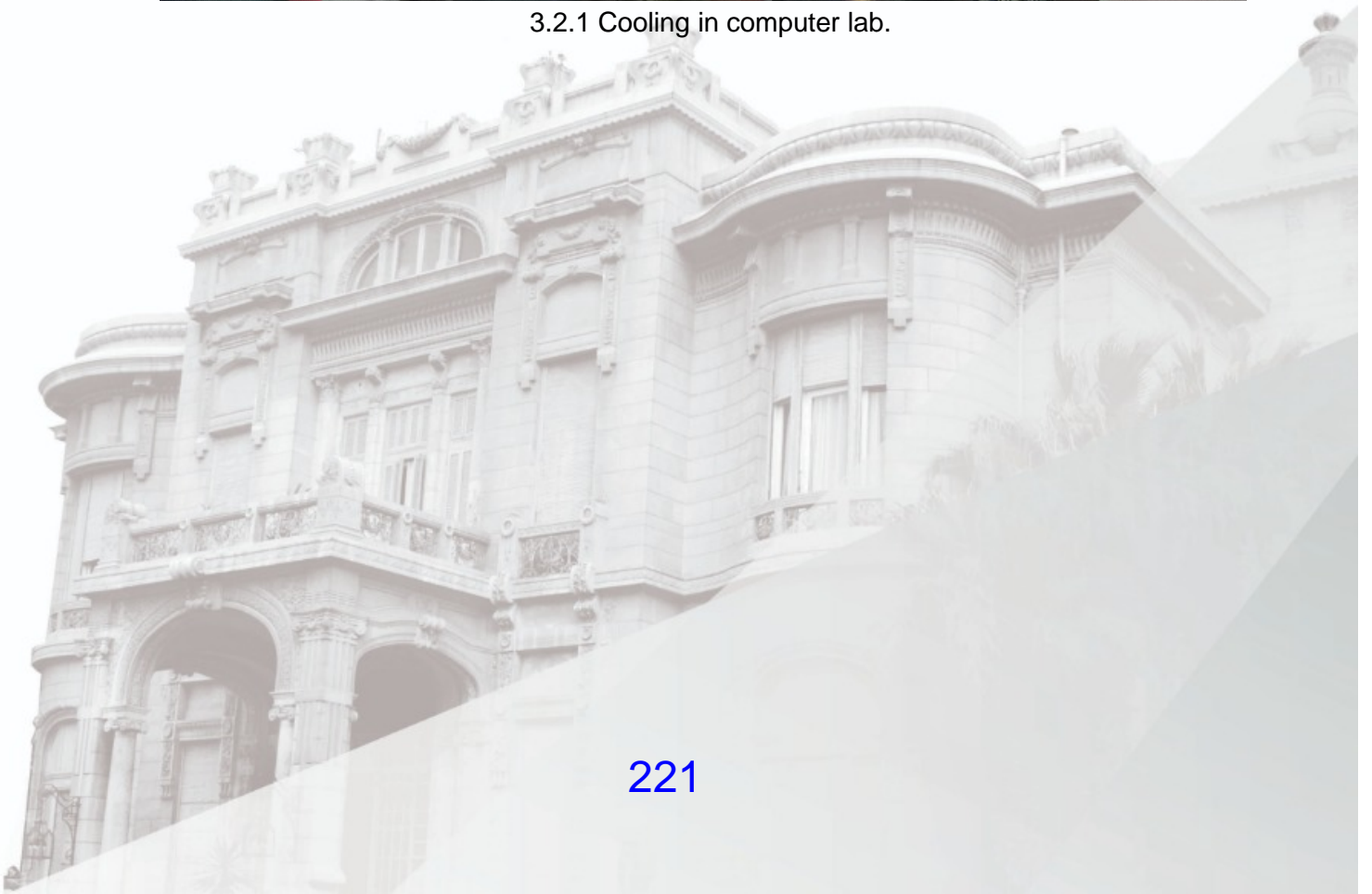
ii. Available method of Cooling

- a. Is there cooling in all occupied zones?
All occupied spaces are conditioned.

b. Status of cooling equipment (photo)



3.2.1 Cooling in computer lab.





3.2.2 Cooling in library.



3.2.3 other cooling equipment's in library.





3.2.4 External units of AC.

- c. Estimated consumption per cooling equipment (average consumption of split AC unit)

Air conditions of the whole building consume electricity as an average 150,000KW: 180,000KW Per year. According to the Egyptian ministry of electricity and energy "Monthly consumption of an AC unit for 8 hours daily is 600 KW".

- iii. Available method of Heating
 - a. Is there heating in all occupied zones?
No
 - b. Status of heating equipment (photos)
No

3.3 Lighting System

- a. Available fixtures types (fluorescent, LED ...etc.) + (photos)

Types of lighting which used in the building spaces is linear fluorescent, except for the entrance, which is equipped with circular spot lights.

Linear Fluorescent has an efficiency of (50:100lumen/watt), which is lower than LED, as average LED fixtures has (37:120 lumen/watt)

LEDs are very efficient relative to every lighting type on the market. Typical source efficiency ranges 37 and 120 lumens/watt. Where LEDs really shine, however, is in their system efficiency (the amount of light that actually reaches the target area after all losses are accounted for). Most values for LED system efficiency fall above 50 lumens/watt.

Fluorescent and CFL lights are very efficient compared to incandescent lights (50-100 lumens/watt source efficiency). They lose out to LEDs principally because their system efficiency is much lower (<30 lumens/watt) due to all of the losses associated with omnidirectional light output and the need to redirect it to a desired area.

LED Vs Fluorescent (Stouchlighting.com)

- b. Condition of lighting fixtures (photos) [\(refer to figs #\)](#)

The whole building contains an average 700 :730 lamps that consume 45000KW /year



3.3.1 Light fixtures in space that poorly daylight.



3.3.2 Spot lights at the entrance of the building.





3.3.3 Lights at corridors.



3.3.4 Lighting density enough to read.

3.4 Plumbing System

Available fixtures types (toilets, urinals, lavatories, showers [if any])

Ground floor contains 1 WC

First floor has 6 WC

Second floor has 5 WC

Each one has 2 lavatories, 2 urinals and 2 toilets.

Totally the whole building has 12 WC (24 lavatories, 24 urinals and 24 toilets)

- Consumption rate of water according to the Egyptian company for water and waste water is ****



Photo 3.4.1 Plumbing fixtures (urinals)



Photo 3.4.2 Plumbing fixtures (lavatories)



Photo 3.4.3 Plumbing fixtures (urinals)

3.5 Summary

Overview on the current situation

Suggestions:

1-Cover the roof of the main hall grass and plants to be a green roof, that will help in decreasing the heat island effect, as well as providing thermal insulation.



2-Insulate walls by foam injection in the voids of hollow concrete blocks, make a circle hole at the top of a wall using an equipment then start to fill the voids with foam, after filling the voids close the hole and paint on it.



3-Replacing windows with double glazing to bring more daylight and reflect the sun temperature.

4-Testing all windows according to air tight.

5-Use another type of HVAC that allows a hidden place contains its ducts not at the front of the building.

6-Use mechanical ventilation to use it in case of poor natural ventilation.

7-Replace all Fluorescent lamps by LED to be more efficient.

8-Use dual flush toilets and low flow fixtures for lavatories.

Finally, Meters and sub-meters shall be provided to track consumption individually (HVAC, Lighting and water)

First: proposed solutions to rationalize electricity consumption in the building

By studying the current position of the Institute's energy situation, it turns out that the work will be done through the following axes:-

The first axis: energy conservation through modern energy-saving lighting technologies

The second axis: maximum benefit from the natural lighting of sunlight through the automatic control of the lighting by shutting off the electric current from the lighting in the case of the availability of sunlight with the possibility of disconnecting the automatic operation if required

The third axis: feeding the Institute's power grid from several sources other than the current feeding from the power grid through the hybrid system (solar-wind)

The first

Energy saving through modern energy-saving lighting technologies

Study of energy rationalization in government buildings

The expenditure on government buildings is usually funded from the state budget, so any savings achieved will pay a direct return to the state, and then this return can be benefited by directing it in other areas

The models of electric energy consumption patterns showed that lighting represents the highest percentage of electric energy consumption, which sometimes reached 93%

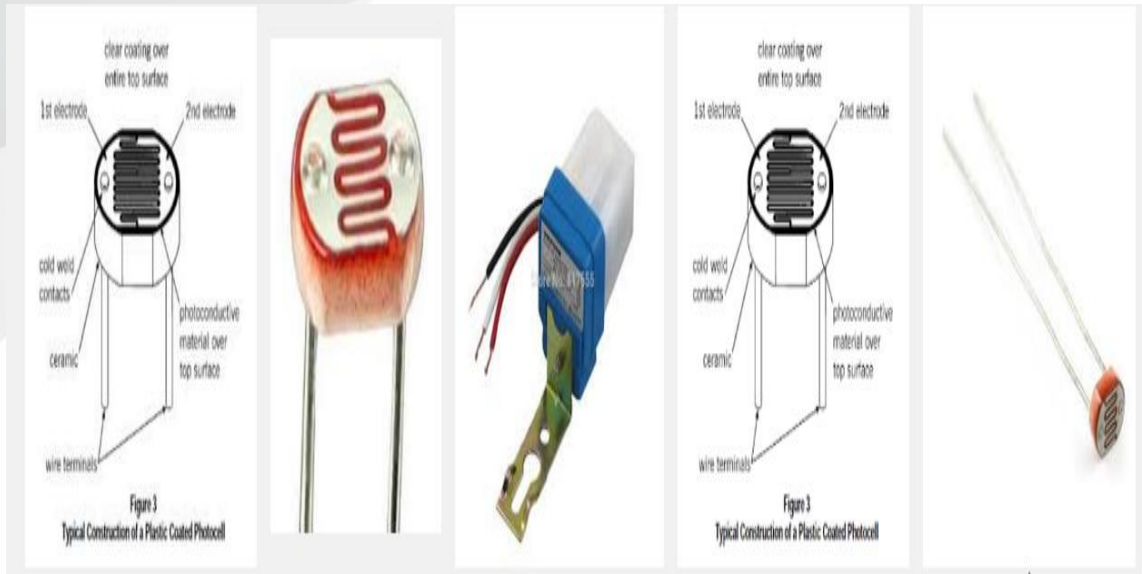
Accordingly, the focus has been on energy-saving lighting system technology use of modern lighting systems led bulbs:

□ This is done by replacing all types of lamps both regular (incandescent) bulbs, compact energy-saving bulbs allows to LED bulbs which provide one percent of electricity consumption compared with ordinary with respect to the same intensity of illumination in the two cases.

- Lighting loads of fluorescent lamps, metal halide detectors and halogen spotlights in the Institute building, their capabilities and the proposed situation

Second stage

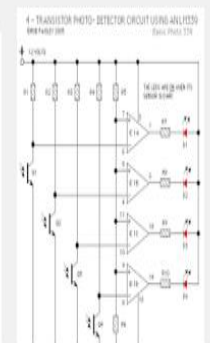
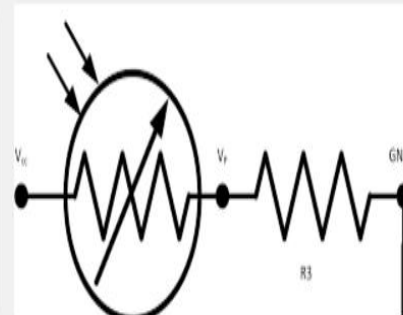
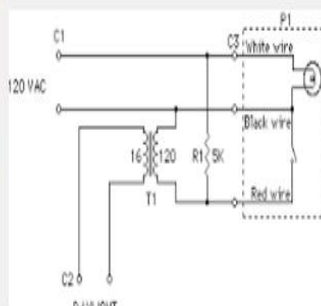
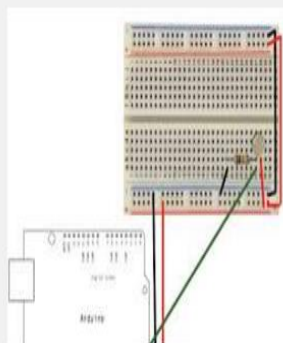
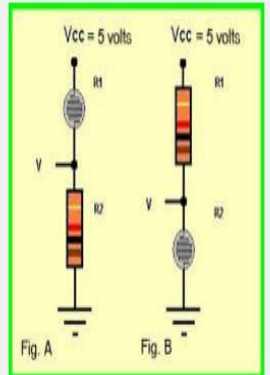
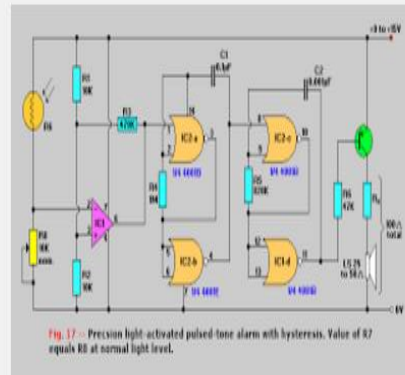
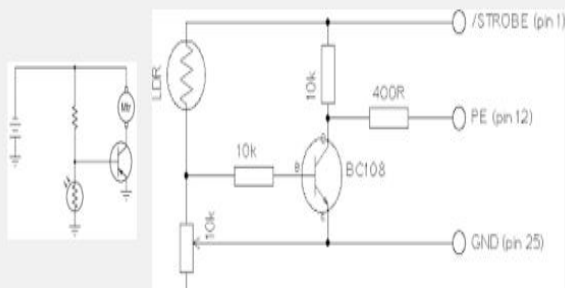
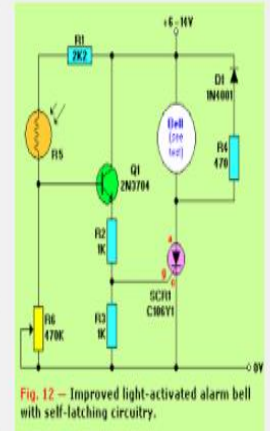
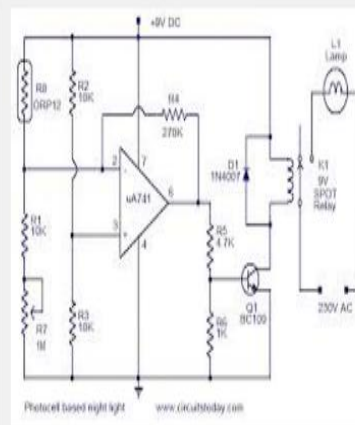
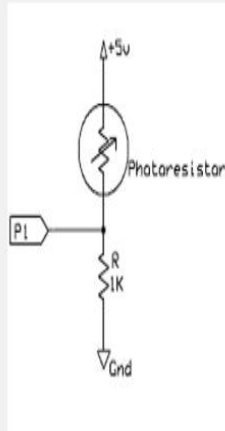
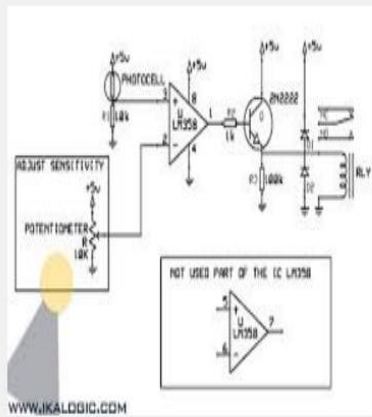
Install light sensors to separate the current from the bulbs if natural sunlight is available



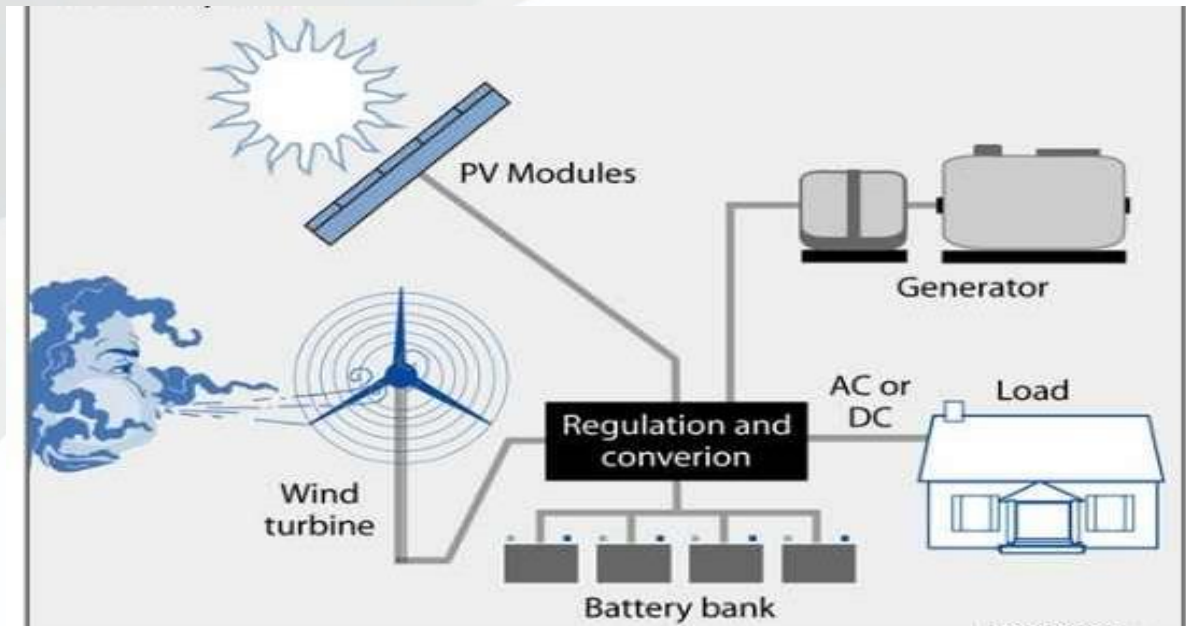
A * - ground floor: including a set of units such as administrative rooms, toilets, security, sandwich, grandstand and photography office with a total of 38 units

* - The first, second, third and fourth floors, which includes a set of units such as faculty members ' rooms, halls and laboratories about 41 units per floor with a total of 164 units for the four floors

- - The total number of units required Building 202 units unit cost about 50 EGP with total cost 10100 EGP



A * - third stage



Feed the Institute's power grid from several sources other than the current feed from the power grid through the hybrid system (solar-wind)

About the importance of renewable energy sources used in the system (Sun - sports) :

Solar energy is a sustainable source of energy that takes advantage of the energy of solar radiation and converts it into electrical energy through photovoltaic cells using the electronic properties of some materials that are classified as Semiconductors (such as silicon) and to ensure the work of these panels more efficiently as well as control the energy produced, it is necessary to connect these panels

Solar energy is a clean source of energy that preserves the environment and works to reduce emissions of harmful carbon oxides, and the life of the solar plant is up to 25 years and these systems can be connected to storage systems that enable them to take advantage of the electric energy produced in times when the sun is not bright.

Wind energy is a sustainable source of energy that takes advantage of the wind energy and convert it into electrical energy through wind turbines using the electromechanical properties of the generator, through which the mechanical movement is converted into electrical energy and to ensure the work of these turbines more efficiently as well as control of the energy produced requires the availability of suitable wind speeds.

Brief description of the system :

- This system is a combination of solar and wind electricity generation as the most important sources of renewable energy, consisting of a photovoltaic cell generation unit and a small wind turbine and the energy generated is stored in batteries.

This system aims to improve the generating capacity and ensure the continuity of the availability of power generation throughout the day and night hours and to achieve a balance between all seasons of the year whether the sunlight at any time decreases or the wind speeds decrease

This system compensates for the reduction in the energy generated from photovoltaic cells from another source .the two sources are environmentally friendly and have no environmental adverse effects, as exporters contribute to reducing carbon emissions by providing capacity from alternative sources from traditional methods.

This system features easy installation, operation and maintenance and low maintenance and operating expenses .

This system is used in lighting areas isolated from the network, street lighting, traffic lights, billboards and in the field of communications .

System specification:

Calculates the value of the necessary capacity for lighting the Institute about 50 kW

The average number of hours worked at the institute is about 8 hours

Hy-H12GOS-Super system components and specifications :

Number of 2 wind turbines 3 kW turbine capacity with a total of 6 kW voltage 220 V variable current frequency 50/60 Hz.

45 polycrystalline solar panels with a capacity of 135 Watts and a voltage of 12 volts per panel with a total capacity of 6,075 kW.

The inverter current changer is integrated with a system controller to connect the two systems, the network and the battery system.

Installation Poles for wind turbines with a height of 11 meters.

Connected cables.

The system requires a total area of 45 square meters, so the three units you will need to 135 square meters note that the surface on all levels of about 100 meters*20 meters =2,000 square meters

Estimated cost of installing a power plant to cover lighting loads at the Institute

In contact with one of the Chinese companies specializing in the supply, manufacture and installation of the hybrid system (solar - wind) about the estimated cost of the proposed system installed in the Institute, we were provided with a quotation for the system capacity of 12 kW:

It turned out that the cost of a unit of the system, which consists of 2 wind turbines, 24 solar panels and all the necessary tasks for the installation of the system total about 15 thousand dollars

The institute requires the installation of 3 systems of the proposed model i.e. about 45 thousand dollars



HY-H12GOS 12KW Wind Solar Hybrid Grid-Off System Quotation

System Specification

Components	Model No.	Specification	QTY	Price
Wind turbine	HY-3000	total 1pos 3000W 98V, 6 blades low wind type rotor diameter: 3m weight: 70kg connection: flange net tower	2	\$4,600
Solar panel	HY-PV260	Total 24pos 260W 36V polysilicon solar modules size: 1640 x 882 x 40mm weight: 18.4kg max. Vmp: 38.2V	24	\$4,500
Junction box	100A	8 Input X 10A 1 output X 100A	1	\$210
Battery bank	200AH / 12V	Total 18pos 200AH deep cycled gel battery, maintenance-free Service life: 5-6years Warranty: 1 year	18	\$4,500
Wind & solar hybrid off-grid controller inverter	HY-C180-88AWMT	Input:: 98Vdc Output: 220Vac, 60/60Hz(customized) Pure Sine Wave Output Output capacity: 8000VA	1	\$3,800
standing-free wind turbine tower	HY-3F3K3P	Total 1pos 11 meter tower tower total height: 11 meters (in 3 parts)	1	\$800
solar panel rooftop installation bracket	HY-T8RPV8K	total 8KW PV ground mounted bracket Material: aluminum Surface treatment: anodizing	1	\$1,500
Cables		Wind wire: RVV3 X 4mm ² Solar panel wire: RVV2 X 2.5mm ² Battery bank wire: RV2 X 16mm ² Solar panel wire: RVV2 X 10mm ² (Prepared by customer)		
Insurance & Shipping				\$750
Document with Embassy sign				\$300
TOTAL COST			<10 sets	\$20,960

Terms:

Delivery Term: 20-25 days after order confirmation

Price Term: CIF Cairo

Price Validity: 30 days (Till May 22, 2016)

Payment Term: 30% T/T as deposit, 70% T/T as balance before delivery.

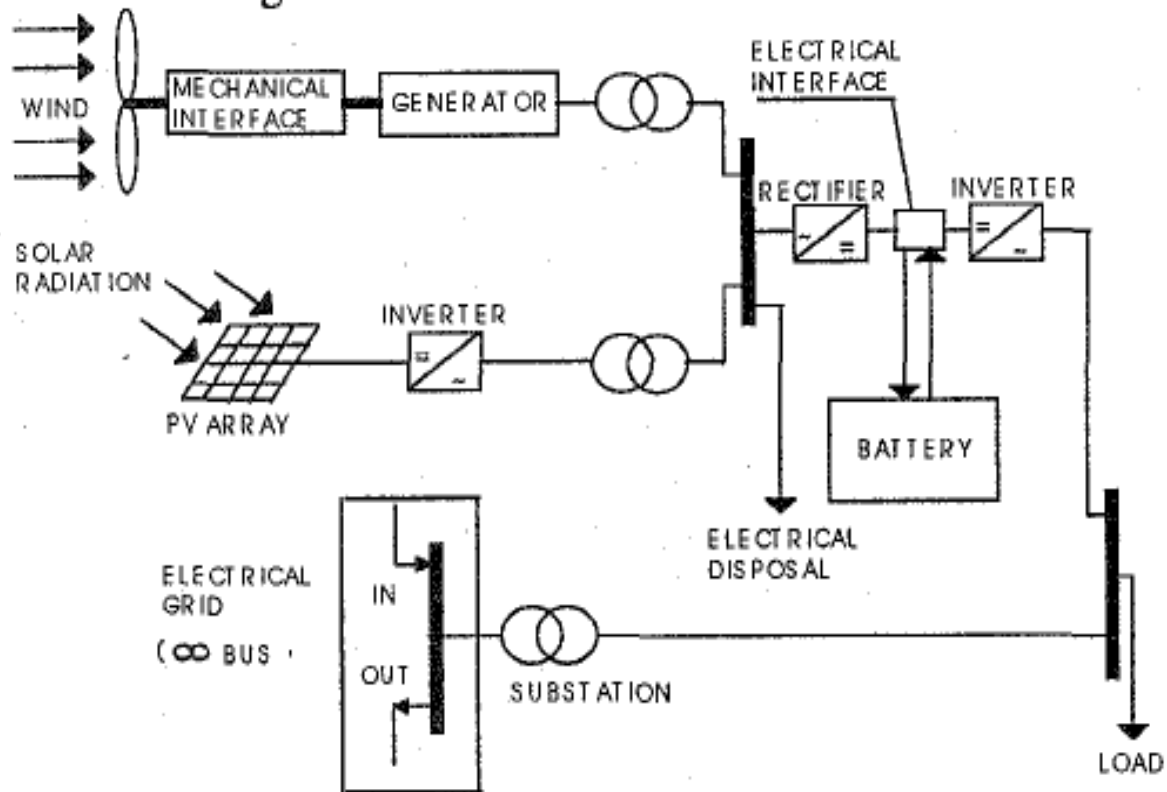


Fig.2 The grid-connected HSWPS

رسم تخطيطي للنظام



A * second: rationalizing water consumption in the building

1. separate air conditioners

- The Institute building has been inspected and it notes that there are many separate air conditioners that are working in good condition and looking at the drainage system notes that some air conditioning hoses are installed in reverse and at an oblique level opposite the correct one, which is carried out in accordance with the origins of the industry and the Egyptian code and it is recommended to install them correctly so that the device is not adversely affected and impedes the drainage and leads to the return of water .some hoses are connected to the drainage pipes next to the building from all sides and note that none of them have a drainage pipe.

- To solve this, it is recommended to use distilled wastewater after treatment with a few percent of chlorine in agriculture to the surface and sides of the building, which aims to take advantage of the water generated by the air conditioners and work to beautify the roofs of buildings in an aesthetic way that gives it a beautiful palette.

The idea is that the process of air conditioning lies in the withdrawal of moist air from indoor spaces to be cooled and then the water condenses and collects inside a pipe which is usually discharged into the sewer, where the approximate estimate of the amount of distilled water released revealed the possibility of producing about two liters of this water within one hour of

In other calculations, it turns out that eight gallons of irrigation water can be obtained from the work of an air conditioner for 15 hours in the hot summer months .

Assuming that there are one million air conditioners running continuously and at the same time for eight hours a day, an additional water supply of about 16,000 cubic meters per day is possible, and the operation of the air conditioner during the summer is supposed to be about 120 days a year .

In a previous study, samples of these water from old and modern air conditioners were collected in sterile packages and after carrying out their analysis, the result of the analysis of these samples showed the presence of a large number of bacteria, especially in the samples collected from the old air conditioners and this number is significantly reduced in the samples collected from the new

- According to the results of the analysis, the study recommended that this water is not suitable for drinking, but that it can be used for irrigation of green gardens, toilets or car washes instead of using the good water used for these purposes .this water can be collected by connecting the air-conditioning drainage p

A•

Delivery and accessories :

- Each tank is equipped with a feed pipe mounted at a low level from its roof with a distance of at least 25cm.

- Each tank shall be provided with a buoy of appropriate diameter equipped with a valve on the filling pipe entering the tank to prevent the water level in the tank from rising above the prescribed limit due to the possibility that the water pressure in the network may rise above the planned filling level of the tank. the valve opening shall be provided with a discharge equivalent to that of the filling pipe on which a lock-lock is to be installed outside the tank (this buoy Valve may be dispensed with in the case of buildings over 30 metres high).

- Each tank should be provided with a pipe to feed the building with a suitable diameter and not less than 10cm of the height of its output from the bottom of the tank .

- The tanks shall be equipped with a surplus pipe at least 1 inch in diameter greater than the diameter of the filling pipe in the case of feeding from the city network directly noting that when feeding the tanks to the water pumps the overflow pipe must be of a suitable diameter to allow the discharge of water coming from the pumps which are under pressure since in with a suitable drainage point on the ground floor and in a visible place with which to monitor In any case, the overflow pipes should not be connected to the sewer pipes in any way, and it is preferable to allocate an independent pipe to drain this overflow that extends to the bottom of the building .

If more than one upper tank is used, these tanks are connected to each other by means of intake pipes or by means of equilibrium pipes .

Requirements for the design, implementation and maintenance :

Paint the walls and floors of the tanks from the inside with a material to be algae, fungi and bacteria after the process of washing the tank of chlorine as well as after each cleaning process .

The tanks must have a waterproofing material to prevent water from leaching from the tank and the opening of the tank must be sealed so as not to allow dust, insects and rodents to enter and to prevent sunlight .

Each tank is provided with a washing pipe with a diameter of between an inch and 4 inches depending on the size of the tank and placed at the level of the bottom of the tank (floor) and reached the overflow pipe with the need to work a lock on it opens the washing time only, and when creating these tanks

Each tank is equipped with one or more ventilation pipes that connect to the outside air penetrating the roof of the tank and ending with an inverted elbow to balance the atmospheric pressure inside the tank to prevent compaction and dislocation during filling and unloading .

The roof of the tank operates one or more holes with suitable dimensions of at least 70 x 80cm to descend inside it for cleaning and maintenance, this hole has a tight cover, and

there must be a vacuum under the tank not less than 60cm for easy installation of the washing pipe and for the maintenance of the tank, pipes and

Insulation requirements :

The external water pipes to and from the tank should be insulated against the sun as well as the walls of the tank .

The holes of the upper tanks must be covered to prevent sunlight and dust from entering the tank and to prevent the growth of algae .

The three water towers on the roof of the Institute building are able to provide water for drinking or fire even during a power outage, because they rely on the hydraulic pressure produced by the height of the water column (caused by gravity) to push water into the entire institute building, however they cannot provide water for a long time without electricity, because they need to

On the other hand, the water tower serves as a reservoir to provide the need for water at peak times as the water level in the reservoir decreases during those hours of the day and is refilled at night .

Recommendations :-

Connect water-lifting pumps to solar panels to run on renewable energy instead of electricity and automatically disconnect when filling tanks

.The facade of the tower can be covered with a kind of seaweed that helps to generate electricity from its bioanalysis. This type of vertical gardens and climbing grasses help revive the surrounding atmosphere in an effort to mitigate global warming.

- The structural body of the tower can be covered with a reflective metal layer (aluminum sheet) or painted with heat and moisture insulating material and eco-friendly and colored in white or silver to appear as if the tower is fading in the sky and this is a kind of visual and sensory manipulation





(



248

