

ASHRAE

1st Edition - September 2018 **NEWS LETTER**



ASHRAE  **Pyramids**
Chapter

A WORD FROM THE CHAPTER PRESIDENT:

My dear colleagues,

I would like to announce the acceptance to have ASHRAE Pyramids Chapter established in Egypt and I am honored to be the first president of this chapter. This is my second achievement to have ASHRAE Chapters in Egypt and proud to be the founder and the first President Elect of ASHRAE Cairo Chapter in 1996.



Sure, I'm lucky to be surrounded by a team of young and middle generation, a team who offered to support and excel to have this new chapter to come to truth.

This chapter was born strong and covers several governorates of Egypt. Definitely we are not in a competition with any other Egyptian Chapter, but for sure we are in competition with success and high service achievement to support our society.

Despite the chapter was born strong, we definitely in need to our friends and brothers support till we find our way and have a successful birth of the chapter. We need to move hand in hand towards supporting our HVAC industry, and follow the ethical rules set by the organization creators and adopts their criterion.

We are expecting your support to ASHRAE Pyramids Chapter for the benefit of our industry and confident to end ever to achieve our goals in a very short period.

We are targeting to extend our professional activities to cover Architects and HVAC technician and to gather people and exchange ideas. We will pay the required effort and attention towards young Engineers and students participation in our activities.

God bless you all.

Ahmed Abd El Ghani

ASHRAE Pyramids Chapter President 2018-2019

A WORD FROM THE CHAPTER FOUNDER:

ASHRAE Pyramids Chapter was founded on June, 2018 with a successful approval from the ASHRAE society board of councils. Really it was a dream and became a fact when I – as Pyramids Chapter Founder- and hand in hand with a great team and group of colleagues have had the wish rather than the will to serve our ASHRAE Society, RAL Region At Large, community, profession, SA Students Activities, YEA Young Engineers in ASHRAE, MP Membership Promotion, HVAC & R industry, GA Government affairs in Egypt, CTT Chapter Technology Transfer & of course the RP Research Promotion.



Actually myself and co-founders of Pyramids Chapter with a great and accumulated experience in different sectors and of various fields – Consultants ,Designers , Contractors , Manufacturers , Traders , Students , Young engineers , women & Suppliers - are looking forward and together with one spirit and ambitious mission also vision to have in our Pyramids Chapter a great diversity of both members and innovative activities, of course we took the ASHRAE MCO Manual of Chapters Operation as a valuable guide to draw our chapter general plans aiming both MBO Management By Objectives and MBR Management By Results towards the PAOE Presidential Awards Of Excellence as planned and targeted by our ASHRAE Society President Sheila Hayter for this year 2018-2019 and coming years.

ASHRAE Pyramids chapters Born to be a Leader as we are the latest founded chapter for ASHRAE all over the world with chapter number 211.

We – all Pyramids Chapter founders , BOG's & Committees' chairs – take the hand to let all our coming members to have the complete opportunities to be merged and interacted within the different committees with an innovative style and way of action plus we all have to transfer to our community the great advantages to be ASHRAE active members and to be added to more than 56000 distinguished members all over the world and over 132 nations focusing on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry.

Pyramids Chapter team and members believe that we shall be an added value within our geographic region of activities as we are located in Giza Governorate BUT to serve probably a great areas in our great EGYPT were not served all past years noting that we – in EGYPT – have more than 650000-700000 professional and registered HVAC& R also Electromechanical engineers from both Mechanical & Electrical engineering as received also documented from the Egyptian Syndicate of Engineers.

My sincere regards to our great team of Pyramids Chapter and our deep thanks to all those who helped our Pyramids chapter to be founded and I point to our Past DRC Engineer Farooq Mehboob & to our brave current DRC Dr. Ahmed Alaa who really guided us and successfully to add to our ASHRAE society the youngest chapter in Africa, Middle East, Region At Large and all over the world.

We are UNITED BY OUR DIFFERENCE is our slogan, longing to follow what our society aim and what our members need.

Maged Fouad Hashem

Pyramids Chapter Founder, BOG & Secretary 2018-2019
ASHRAE RAL RVC GAC 2016-2019
ASHRAE RAL CRC Organizing Chair 2018-2021

Our Valuable Board of Governors



Eng. Ahmed Adb El Ghani
Chapter Co-Founder, BOG
Chapter President



Prof. Ahmed Medhat
Chapter Co-Founder, BOG
President Elect



Eng. Maged Fouad
Chapter Founder, BOG & Secretary
ASHRAE RAL RVC GAC 2016-2019
ASHRAE RAL CRC Organizing Chair
2018-2021



Eng. Ahmad Nour
Chapter Co-Founder, BOG
Treasurer & RP Chair
ASHRAE RAL ARVC RP
2018-2020



Dr. Kamal El Desouky
Chapter Co-Founder,
BOG
Vice Treasurer



Eng. Ahmed Bolbol
Chapter Co-Founder, BOG
Vice President
ASHRAE CRC Organization
Committee member 2018-2021



Prof. Ahmed El Safty
Chapter Co-Founder, BOG



Eng. Maria Morgan
Chapter Co-Founder, BOG
Vice secretary
MP Chair



Eng. Ali Yassien
Chapter Co-Founder, BOG

Other Co-Founders



Eng. Sherif Omran
Chapter Co-Founder
CTTC Chair



Eng. Fady Mourad
Chapter Co-Founder
GAC Chair



Eng. Nadia Ali
Chapter Co-Founder
ASHRAE RAL ARVC YEA
2018-2020
YEA Chair



Eng. Fady Kamal
Chapter Co-Founder
ECC Chair



Eng. Mohamed Ali
Chapter Co-Founder
Historical Chair



Eng. Lina Maged
Chapter Co-Founder
Woman in ASHRAE Chair



Eng. Ahmed Nabil
Chapter Co-Founder
GAC CO - Chair



Eng. Salah Hassan
Chapter Co-Founder
GAC Co-Chair



Eng. Nevine Ahmed
Chapter Co-Founder
YEA Co-Chair



Eng. Osama Bekhit
CTTC Co Chair



Eng. Abanoub Samir
Refrigeration Co-Chair
SA Co-Chair



Eng. Sarah Ahmed
SA Team Leader



About ASHRAE:

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry. Through research, standards writing, publishing and continuing education, ASHRAE shapes tomorrow's built environment today. ASHRAE was formed as the American Society of Heating, Refrigerating and Air-Conditioning Engineers by the merger in 1959 of American Society of Heating and Air-Conditioning Engineers (ASHAE) founded in 1894 and The American Society of Refrigerating Engineers (ASRE) founded in 1904.

ASHRAE's Mission and Vision:

Mission:

To advance the arts and sciences of heating, ventilating, air conditioning and refrigerating to serve humanity and promote a sustainable world.

Vision:

ASHRAE will be the global **leader**, the foremost source of technical and educational information, and the primary provider of opportunity for professional growth in the arts and sciences of heating, ventilating, air conditioning and refrigerating.

ASHRAE's Core Values:

Excellence:

ASHRAE education, technical information and all other activities and products will always reflect the best practices that lead our industry. We strive for continuous improvement and innovation in all our practices and products.

Commitment:

ASHRAE and its members are passionate about serving the built environment, creating value, and recognizing the accomplishments of others.

Integrity:

ASHRAE is committed to the highest ethical standards. We work transparently, observing essential requirements for due process and peer reviews to assure our members and stakeholders that we do the right things the right way.

Collaboration:

ASHRAE seeks and embraces collaborative efforts with organizations, agencies, and individuals sharing our commitment to sustainable built environments.

Volunteerism:

Members lead ASHRAE at every level, serving ASHRAE and helping ASHRAE serve society.

Why Should I be an ASHRAE Member? :

ASHRAE Society is a respectable international organization leading the HVAC/R Science & industry in the whole world, it covers the activities of anyone concerned with these fields related to consultants, contractors, building owners, manufacturers, educational institutions, research organizations, governmental organizations, students. All these categories can benefit of the following:

- 1- **Publications & Resources**, Such as ASHRAE handbooks, monthly ASHRAE journal, e-industry & e-society newsletter, high performance buildings, monthly magazine. All these publications are available to ASHRAE members.
- 2- **Professional education & career development**, ASHRAE members have discounted education courses, professional certification programs & license, technical seminars.
- 3- **Networking**, ASHRAE are able to connect regionally & internationally with over 53000 members over 170 chapters worldwide, sharing annual & winter conferences and participating in their local chapter activities.

These points are quick description about some of the advantages when being an ASHRAE member.

Email: info@ashraepyramids.org

Web: WWW.ASHRAEPYRAMIDS.ORG

Geographic Areas For Pyramids Chapter:

SO CLOSE NO MATTER HOW FAR

1- Giza Governorate:

Never forgetting the pyramids, sphinx visits rituals, attending the sound and light evening show and the new Grand Egyptian Museum.



2- Upper Egypt Governorate “ Menya – Beni Sowaf – Fayoum – Assiut – Sohag – Luxor & Aswan ”:

Home of the ancient Pharaohs, Egypt is a dazzling destination of temples and tombs that wow all who visit. It's not all historic treasures though.



Archaeology fans should visit Luxor and Aswan.

With vast tracts of desert and famed Nile River there's something for everyone here. Enjoying a Nile cruise.



3- Delta Governorates “Monoufia – Sharkeya , Kalyoubeya, Tanta , Dakahleya & Between small cities”.

4- Port Said, Ismaileya & Suez Governorates:

Where you can find the new Suez Canal is a mega project in Egypt that was launched on 5 August 2014 by President Abdel Fattah el-Sisi.



The project's aim is to increase the role of the Suez Canal region in international trading and to develop the three canal cities: Suez Ismailia and Port Said

Committees Description

Membership Promotion (MP):

The Membership Promotion committee is essential to chapter's success and its responsibilities are as following

- 1- Attracting new members who will be active in the Society, locally and/or at the Society level.
- 2- Encouraging membership from all segments of the industry to join.
- 3- Encouraging advancement to higher grades of membership when candidates' qualifications meet the specified requirements.
- 4- In conjunction with the Secretary, ascertaining that all prospective chapter members are bona fide members of Society.
- 5- Reducing the number of member resignations or membership lapses.
- 6- Advising the President and the Reception Committee when new members are elected or when members advance in membership grade, to ensure proper recognition at chapter meetings and in chapter publications.
- 7- Organizing and executing membership drives, including encouraging participation from local consulting firms.
- 8- Receiving from the Attendance Committee and/or Reception Committee a record of the names of people attending the chapter meetings.
- 9- Cooperating with and seeking advice from the Membership Promotion Regional Vice Chair.
- 10- Providing a computer and internet access at chapter meetings so that individuals can join online.
- 11- Reviewing each member's status to select and recommend nominations for honors and awards.
- 12- Collaborating with Student Activities Committee and Young Engineers in ASHRAE Committee to encourage students to retain their memberships when they graduate.

MP chair: Eng. Maria Morgan - chapter Co- Founder & BOG.



Chapter Technology Transfer (CTTC):

The Chapter Technology Transfer committee is one of the pillars of ASHRAE Chapter in which it fulfills the duty of technology transfer and make sure that members and society are up to date with latest technologies in HVAC, and its responsibilities are as following:

- 1- The Chair's attendance at the Chapter Technology Transfer Workshop at the CRC meeting.
- 2- Coordinating dissemination of technical information in the chapter's geographic area.
- 3- Promoting and administering the chapter's Technology Awards program and encouraging entries in the regional competition.
- 4- Keeping the chapter informed on technical issues related to heating, ventilating, refrigeration and air conditioning.
- 5- Providing assistance to the Chapter Publicity Committee in contacting local news media and chapter publications and offering to provide necessary information and material.
- 6- Providing assistance to the Chapter Historian in maintaining a history of the chapter's technical and energy activities.
- 7- Reporting to the RVC for the Chapter Technology Transfer Committee.
- 8- Assisting the RVC for Chapter Technology Transfer to achieve the goals of the Society at the chapter level.
- 9- Planning the speakers and other logistics of monthly chapter meetings for the year, including reviewing speaker presentations for ASHRAE Commercialism Policy infractions.

CTT chair: Eng. Sherief Omran - chapter Co- Founder



Government Affairs (GAC):

ASHRAE Pyramids Chapter is very keen on relationship with government officials to provide much help as possible to sustain the environment and keep up to date with international trends of sustainability, And Government Affairs committee responsibilities are as following:

- 1- Providing current, relevant information to chapter members regarding government activities in their communities, including any limitations placed on these activities by local, state or provincial governmental bodies.
- 2- Keeping the chapter, region and Society Government Activities staff informed on relevant governmental activities.
- 3- Coordinating dissemination of governmental activities-related information to members and obtaining feedback from chapter and individual member government activities.
- 4- Maintaining tools to train and enable chapter members to effect positive interactions with government entities in their communities, especially in the use of Society documents and the advancement of the Society's public policy agenda.
- 5- Serving as a clearinghouse of government adoptions of ASHRAE-developed and endorsed standards, guidelines and positions.
- 6- Keeping local, provincial and state governments updated on technical issues.
- 7- Promoting the appointment of chapter members to local, provincial and state governmental bodies.
- 8- Reporting PAOE points earned in accomplishing the committee's goals.
- 9- Providing assistance to the Chapter Publicity Committee (if one exists) in contacting local news media and chapter publications and offering to provide necessary information and material.
- 10- Providing assistance to the Chapter Historian in maintaining a history of the chapter's governmental activities.
- 11 - Reporting to the Regional vice Chair (RVC) for the Government Affairs Committee.
- 12- Assisting the RVC for Government Affairs to achieve the goals of the Society at the chapter level.
- 13- The Chapter GAC chair is responsible for informing chapter members involved in GAC activities of any local, provincial or state statutory or regulatory limitations placed upon government activities.



GAC chair: Eng. Fady Mourad - chapter Co- Founder.

Student Activities Committee (SA):

Student Activities Committee develops a comprehensive program for the educational community for the purpose of promoting and encouraging engineering and HVAC&R careers. It administers and promotes student activities at all levels in the educational system. and committee responsibilities are as following:

- 1- Attend the SAC Workshop at the CRC.
- 2- For regions that have a spring CRC, the Chair for the next year is encouraged to attend the Student Activities Workshop and CRC.
- 3- Act as liaison between the chapter and area educational institutions.
- 4- Develop and coordinate awards, scholarships and other student incentives.
- 5- Encourage the formation and continuing operation of student engineering organizations such as ASHRAE Student Branches.
- 6- Recruit new student members.
- 7- Provide information on present and future industry manpower needs at both faculty and student levels, by means of counseling, programs, group discussion, etc.
- 8- Promote credit courses in the fields of heating, ventilating, air conditioning and refrigerating at universities, colleges, technical institutes and junior colleges.
- 9- Provide speakers to college and high school groups.
- 10- Provide individual counseling to promote HVAC&R fields of interest to college students.
- 11- Plan use of visual aid presentations for high schools and trade school groups; materials are available through the RVC for Student Activities.
- 12- Cooperate with and seek advice from the RVC for Student Activities.
- 13- Provide to the RVC PAOE statistical report forms.
- 14- Collaborate with the Membership Promotion Committee and Young Engineers in ASHRAE Committee to contact and encourage graduating student members to continue their membership through the SmartStart program. Contact graduating students toward the end of the school year, preferably two or three months prior to the graduation dates.



SA chair: Prof. Ahmed El Safty - Chapter Co- Founder, BOG

Research Promotion Committee (RP):

The Research Promotion Committee manages and supports both the Society-level fundraising and Chapter-level fundraising of the RP Campaign. ASHRAE is popular by its standards and up to date information concerning the HVAC and RP Committee is the backbone for funding this type of research and committee responsibilities are as following:

- 1- Attending the CRC and Research Promotion Centralized Training.
- 2- Communicating effectively the objectives, accomplishments and benefits of ASHRAE research and its value to every Society member and the industry.
- 3- Increasing the annual income for Society sponsored research through chapter solicitation of members and businesses that directly or indirectly benefit from ASHRAE research.
- 4- Providing support for and collecting funds for the ASHRAE Foundation and scholarships.
- 5- Coordinate efforts to obtain chapter Full Circle donations.
- 6- In collaboration with chapter officers, developing a plan and setting a total goal for funds to be collected.
- 7- Developing a prospect list of businesses in the area, especially those represented in the Society membership and those in an ASHRAE-related field.
- 8- Assigning minimum goals for the prospects.
- 9- Assigning each prospect to a committee member and preparing a detailed program with targeted dates for activities.
- 10- Following current administrative procedures for collecting and reporting contributions.
- 11- Completing the Research Promotion Donor Form and submitting it with all checks to Research Promotion.
- 12- Maintaining a written record of each activity.
- 13- Cooperating and coordinating efforts with Regional Vice-Chairs for Research Promotion.
- 14- Coordinating with chapter officers to ensure that one meeting per year is dedicated to "Research" or "Research Promotion".

RP chair: Eng. Ahmed Nour
Chapter Co- Founder, BOG
ASHRAE RAL ARVC 2018 -2020



Young Engineers in ASHRAE (YEA):

The Young Engineers in ASHRAE (YEA) Committee enhances member benefits for young professional ASHRAE members, 35 years old and younger, by identifying activities and services focused on their needs. and committee responsibilities are as following:

- 1- Attracting new Young Engineers in ASHRAE who will be actively involved in Society, locally and/or at Society level.
- 2- Encouraging membership from all segments of industry.
- 3- Organizing activities focused at attracting and retaining Young Engineers in ASHRAE.
- 4- Working with the Student Activities Committee to encourage student transfers.

**YEA chair: Eng. Nadia Ali - Chapter Co- Founder
ASHRAE RAL ARVC YEA**



Electronic Communications Committee (ECC) :

Electronic Communications Committee (ECC) identifies the electronic communication needs of the membership and staff, recommends and maintains policies, and ensures that the implementation of information technologies meets the objectives and needs of the Society. and committee responsibilities are as following:

- 1- Serving as the interface between the BOG and the website maintenance company (if one exists) to ensure all items requested by the BOG are uploaded/updated on the chapter's and the region's websites.
- 2- Providing a budget for website activities to the Treasurer.
- 3- Managing the website budget to include the costs of the website maintenance company and any revenue from business card ads, job postings and online store sales.
- 4- Ensuring that the chapter's website complies with Society's website policies.
- 5- Interfacing with the Regional Electronic Communications Chair (RECC), for all questions, concerns and updates to ECC rules and regulations.
- 6- Attending all BOG meetings.
- 7- Establishing an online payment system for chapter activities.

8- Assisting the BOG in learning and utilizing new software that is available (e.g. web conferencing)

9- Working with Chapter Technology Transfer Committee, Attendance Committee, Reception Committee and Special Events Committee in setting up and maintaining the chapter's online registration system.

10- Working with Chapter Publications Committee and/or Newsletter Editor to assist with electronic distribution of the Chapter's eNewsletter, including posting both current and past issues on the Chapter's website and via Social Media.

11- Working with Publicity Committee when using electronic methods of publicity, including use of Social Media.

12- Performing other duties as assigned by the chapter President.



EEC chair: Eng. Fady Kamal - Chapter Co- Founder

Historical Committee:

Chapter Historian Committee is responsible for documenting, tracking all chapter's activities, locally and regionally, including old CRC reports, short histories of people, companies, or systems, updates to our Chapter history, ribbons and awards, photographs, and other media.

- 1- Requesting Chapter Historians to interview presidential and long-time members to provide be in writing or on audio tape memories of industry history and its progress for inclusion in records, at the CRC and/or on the chapter's website.
- 2- Taking pictures of chapter functions and, if possible, of old air conditioning and refrigeration installations for inclusion in eNewsletters, records and programs.
- 3- Checking with the chapter past and present officers for the availability of chapter items of a historical nature.
- 4- Attending the CRC – including the History workshop – and reporting the chapter's progress to the Historian for comparison with other Regional chapters.
- 5- Providing the chapter eNewsletter editor articles about chapter history and progress to include in the eNewsletter.
- 6- Updating historical records annually including updating the location of chapter property Sample spreadsheets for tracking chapter officers and location of chapter property.
- 7- Preparing a display for CRC and showing at a chapter meeting at least once a year.
- 8- Preparing a written or digital history of the chapter, member, company or equipment specific to the chapter for submission for Gold Ribbon Award and possibly for Lou Flagg Award.



Historical Committee chair: Eng. Mohamed Ali- Chapter Co- Founder

DESIGN OF OPTIMAL COOLING SYSTEMS IN RURAL DEVELOPMENT IN UPPER EGYPT

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ABSTRACT:

This paper focuses on the practical investigation and field experimental analysis of in-service cooling systems. The main goals are evaluating and optimizing energy consumption of the expected commonly used cooling systems in Upper Egypt. Based on field experimental results, an extensive analysis were executed to evaluate the impact of energy consumptions of different cooling systems especially indirect and direct evaporative systems against traditional water or/and air-cooled direct expansion systems, and chilled water systems and simple multi-bank evaporative systems. Investigations in Upper Egypt showed that the use of air-cooled cooling systems leads to a very low energy efficiency ratio, EER, and poor coefficient of performances. While water-cooled cooling systems ranged from 25KW to 175KW in cooling capacity showed good practices but have higher initial and running costs, which are not anticipated for residential projects. Evaporative systems, which have over 92%, effectiveness's could be used in limited situations, While, utilizing indirect evaporative system combined with direct enclosed fog system, IEDEF, could be more efficient and durable in Upper Egypt Climates. The paper outspreads the detailed design of typical IEDEF cooling system based on pre-defined architectural approach for common buildings designs that meet both of culture and life styles of residential applications in Upper Egypt.

KEYWORDS: Hot and Dry Climates, HVAC-Systems, and Evaporative Cooling Systems.

INTRODUCTION:

Upper Egypt citizen's cultures and life styles are reflected on their designs and types of housing as most of designs have the same construction concept, circulation, and feeling approaches [1]. Fig.1 show one of commonly used building designs including ground, fist floors, and patio in the middle of house. Families for meetings use patios continuously; while some of owners leave it open to sky and others closed it by operable glazed skylights [2]. Generally Upper Egypt is considered as hot and dry climate as per the following conditions:

Latitude	From 22.50-to-23.00 Deg. North								
Elevation.	From 80 m-to-160 m Over Sea Level								
Average Daily Range	Ranged From 16OC -to-17OC.								
Summer Design DBT	Ranged From 40OC -to-47OC								
Summer Avg. RH%	Ranged From 10%-to-20 %								
Winter Design DBT	Ranged From 17OC -to-22OC								
Winter Avg. RH%	Ranged From 20%-to-50 %.								
Exposures	NE	E	SE	S	SW	W	NW	N	HOR
Min. SHG W/m2	98.1	574.4	360.0	134.3	360.0	574.4	97.6	82.4	648.7
Max. SHG W/m2	569.3	741.3	799.2	735.6	799.2	741.3	558.7	179.3	896.8

DBT = Dry Bulb Temperature, RH% = Relative Humidity, SHG = Solar Heat Gain

Min = Minimum, Max = Maximum, Avg = Average

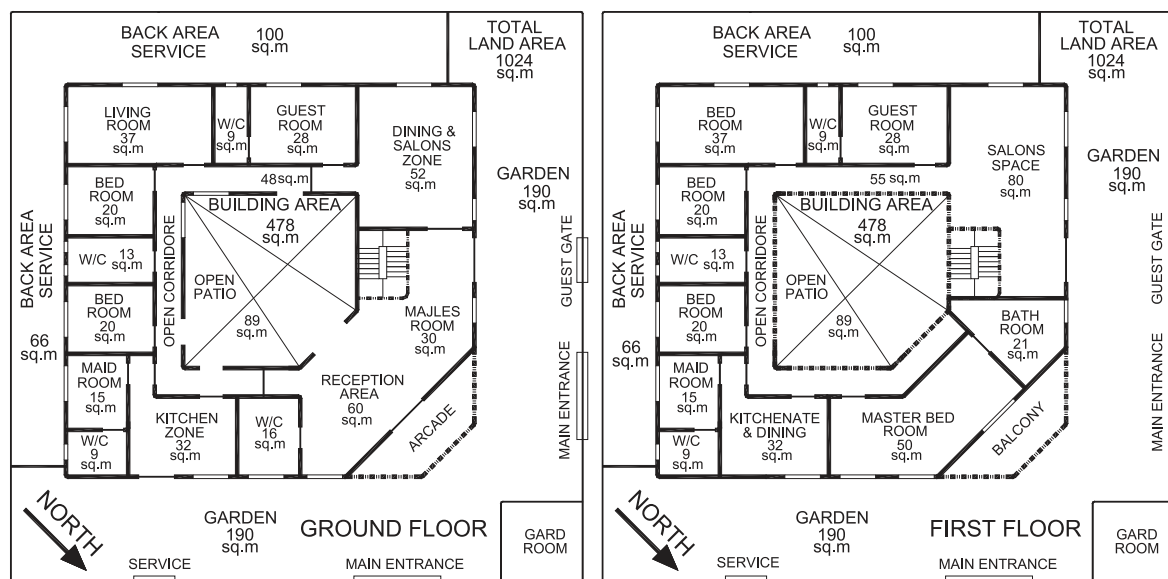


Fig.1
Conceptual Design Layout of Under Study Residential Building

Human biological and physiological impacts were studied to evaluate and justify the acceptable comfort conditions limits [3]. Outdoors design conditions, prevailing sandy-storms, comfort requirements, building pressurization, and estimated thermal loads, affect the economical operations of cooling systems [4].

PROPOSED COOLING SYSTEMS:

Building envelopes and their characteristics play a vital role in controlling and protecting buildings from external extreme conditions [1, 5], this was implemented by local codes to reduce and limit the overall heat transfer coefficients all used materials and treat exposures to limit solar heat gains, while cooling systems will adjust and produce acceptable Indoor Air Quality IAQ for occupants according to thermal acclimatization of citizens [6]. The main Thermal Factors that directly affect indoor air quality for acclimated peoples in Upper Egypt are indoor air dry bulb temperature, DBTOC, air relative humidity, RH%, mean radiant temperatures, MRTOC, and local air speed, AV m/s, over occupants [7]. Previous researches show that from 28OC-to-30OC DBT, 45%-to-60% RH%, and 30OC-to-35 OC MRT, and 0.20 m/s -to-0.3 m/s AV could be well accepted for occupants in residential applications [8].

Table 1 shows the estimated thermal cooling loads summary of four different case studies related to the understudy family house presented in Fig. 1 including the presence of open and closed patio and also incase of using full outside air scavenging strategies. The latter strategies are used in many situations to help and protect occupants from the feeling of staying in enclosures and enjoying with clean and fresh air, as pollutions and air contaminations are minimal in Upper Egypt [8].

Estimated cooling loads calculations are based on net floor level height 3.00m, window-wall ratio, WWR, 13% -to-17%, indoor conditions are 28OC DBT, 50% RH%, 35 OC MRT, 0.25 m/s, AV, are accepted for occupants in residential applications [3, 5], weighted average overall heat transfer coefficient 1.119 W/m² OC to 1.4310 W/m² OC, total lighting and power intensities are 22.5 W/m² and the maximum occupancy rate is one person per 50m² of the built-up footprint area.

Case	Description	I II III	G.S.H G.T.H G.SHF	R.S.H R.T.H R.SHF	S.A. Qty. F.A. % Overall-U	Area, m2 (l/s)/kW Coil ADP	In-Coil Off-Coil DBT/WBT
1	Ground & First Floors at Open Patio	I II III	120.74 122.99 0.9800	98.41 101.29 0.9700	7551 6.5%–8.0% 1.1190	778.00 61.39 58.30	29.8 / 19.9 16.1 / 15.2 OC / OC
2	Ground & First Floors at Closed Patio, Skylight	I II III	177.13 179.31 0.9880	150.62 155.41 0.9690	11327 4.5%-7.5% 1.4310	956.11 63.17 58.40	29.2 / 19.7 16.1 / 15.2 OC / OC
3	Ground & First Floors at Open Patio & 100% Fresh Air	I II III	271.01 288.91 0.9381	98.41 101.29 0.9700	7551 100% 1.1190	778.00 26.14 54.80	47.0 / 24.4 16.1 / 14.1 OC / OC
4	Ground & First Floors at Closed Patio 100% F.A.	I II III	419.42 447.13 0.9380	150.62 155.41 0.9690	11327 100% 1.4310	956.11 25.33 54.80	47.0 / 24.4 16.1 / 14.1 OC / OC
G.S.H, Grand, Coil, Sensible Heat, kW G.T.H, Grand, Coil, Total Heat, kW G.SHF, Grand Sensible Heat Factor R.S.H, Room Sensible Heat, kW R.T.H, Room Total Heat, kW R.SHF, Room Sensible Heat Factor. SHF = Sensible Heat / Total Heat				S.A.Qty, Supply Air Quantity, l/s ADP, Coil, Apparatus Dew-Point, OC Overall-U, Weighted Average Overall Heat Transfer Coefficients of Building Elements, W/m2 OC DBT, Dry Bulb Temperature, OC WBT, Wet Bulb Temperature, OC F.A.%, Fresh Air Percentage.			

Table 1

Estimated Thermal Cooling Loads Summary for Four Building Cases Study

These four case studies focuses on the matched equipment cooling capacities and on the anticipated systems that could be utilized in hot and dry climate to achieve comparable indoor comfort conditions, with optimum EER, and that could be also considered and implemented in the Egyptian Energy Efficiency Codes EEEEC. Table (2) shows different cooling system selection summary of mentioned four cases including air-cooled and water-cooled direct expansion systems or liquid water chillers. Cooling capacities are presented in metric and imperial units as, till now in Egypt, tons of refrigeration, T.R, is more sense and value for the local engineers and also for EER's that based on both cooling unit only and the global cooling system, i.e. cooling unit, air handling units, pumps, cooling tower, sand filters...etc., and finally the ratings KW/T.R.

T.R = 12000 Btu/hr = 3.51597 KW,

EER = (Btu/hr) / (watts), (Cooling capacity) / (Power Consumption)

Add. = Additional Power for air handling units, cooling tower, chilled & condenser pumps.

Case	Capacity		Units + Add.	Unit	System	Unit	Syste	System
	KW	T.R	Power KW	EER	EER	KW/T.R	m KW	KW/T.R
1A	2*63.15	35.92	55.00+00.00	7.84	7.84	1.531	55.00	1.531
1B	2*62.54	35.57	64.00+5.00	6.67	6.19	1.799	69.00	1.940
1C	2*66.35	37.74	33.20+10.00	12.72	12.05	0.879	43.20	1.146
1D	128.33	36.50	58.73+15.00	7.50	6.64	1.609	73.73	2.020
1E	123.86	35.23	31.00+25.00	13.60	10.46	0.880	56.00	1.589
2A	2*90.22	51.32	82.00+00.00	7.50	7.51	1.598	82.00	1.598
2B	2*93.17	52.99	86.00+7.500	7.39	6.99	1.623	93.50	1.767
2C	2*96.37	54.82	50.96+15.00	12.91	11.88	0.929	65.96	1.204
2D	186.35	53.00	84.80+22.50	7.50	6.91	1.594	107.30	2.025
2E	258.78	73.60	53.85+32.50	16.4	13.83	0.733	86.35	1.173

Case	Capacity KW T.R		Units + Add. Power KW	Unit EER	System EER	Unit KW/T.R	Syste m KW	System KW/T.R
3A	47OC DBT Is Not Accepted For Inlet Cooling Coil Conditions Of Packaged Units							
3B	4*62.54	71.15	128.00+15.00	6.67	6.19	1.799	143.00	2.010
3C	47OC DBT Is Not Accepted For Inlet Cooling Coil Conditions Of Packaged Units							
3D	297.80	84.70	139.23+20.00	7.30	6.63	1.647	159.23	1.880
3E	289.72	82.40	61.42+25.00	16.10	12.45	0.747	86.42	1.049
4A	47OC DBT Is Not Accepted For Inlet Cooling Coil Conditions Of Packaged Units							
4B	4*116.06	132.04	208.00+20.00	7.62	7.27	1.575	228.00	1.727
4C	47OC DBT Is Not Accepted For Inlet Cooling Coil Conditions Of Packaged Units							
4D	474.66	135.00	225.00+25.00	7.20	6.60	1.670	250.00	1.852
4E	482.39	137.20	101.63+30.00	16.2	13.00	0.742	131.63	0.959

Cases 1,2,3, & 4 Represent Cooling Loads Selection of HVAC System of Building
A, Air-Cooled Packaged Units, Self-Contained or Split Type.
B, Air-Cooled Direct Expansion Units, Air handling Units & Condensing Units.
C, Water-Cooled Packaged Units, Self-Contained Only.
D, Air-Cooled Liquid Water Chiller.
E, Water-Cooled Liquid Water Chiller.

Table 2
EER, Power Ratings, and Power/Capacity Ratios of the Suggested
Five Cooling Systems Alternatives Based on the Four Case Studies

Table 2 Describes the real selections of cooling systems based on international manufacturers available in the Egyptian market, use of standard units, lower initial cost, reasonable EER, common practices, maintenance and spare parts availability, In this table cases assigned with characters C & E show that water-cooled packaged and chillers units which are maintain and minimize the losses in cooling capacities as its operation principles are based on cooling towers “evaporative cooling” that is affected by wet bulb temperature only.

Generally the wet bulb temperatures are almost stable and ranged from (21.00OC-to-24.00OC).

Also water-cooled cooling systems have good sustainability in hot and dry climate as they consume low energy up to 0.959 kW / T.R compared with air-cooled system that have high power demands reaching 2.020 kW / T.R.

SUGGESTED COOLING SYSTEMS:

Because of this work is devoted to the design and construction of low initial and running cost cooling system that could be utilized to serve residential and some public-use commercial applications in Upper Egypt. Fig.2 shows the schematic flow diagram of the suggested system based on calculations of Case-4 in Table 1. Suggested system has high EER based on combinations of indirect evaporative cooling systems, and direct evaporative cooling system based on enclosed flash evaporation process (micro-mist or fog system). Flash evaporation concept is basically depends on water evaporates only from the surface, so, the faster the water evaporates, the faster the ambient conditions are change. The latter could be enhancing when the surface area of the droplets in relation to the volume of water is greatly increased, and the action of a small water droplets will stay airborne for a longer period before falling.

These could be accomplished by increasing the water pressure to over 70 bars using positive displacement plunger pump and at this pressure the water is atomized into micron size droplets (droplet size is less than 50micro-meter) when using nozzle orifice diameter that

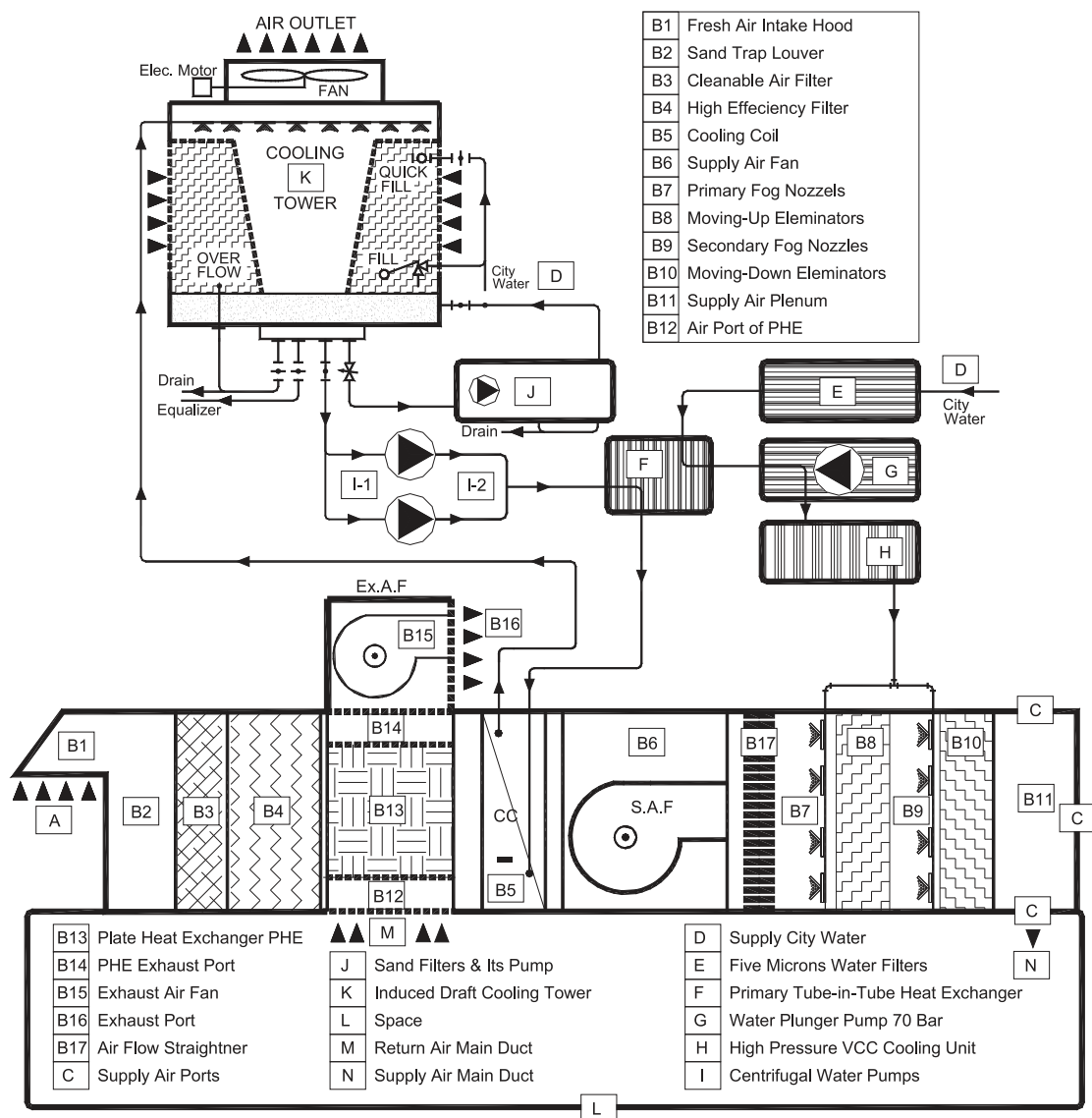


Fig.2

Suggested Evaporative Cooling System Using Indirect Cooling Tower System , Air-to-Air Plate Heat Exchanger and Flashing, Fog, Chamber

ranged from 0.110 mm to 0.380 mm which can flash water and produce droplet sizes less than 50 micro-meter in diameter at number of droplets more than 7500 times the low pressure nozzles. This approach leads to surface area to volume ratio over 400 compared with normal spraying nozzles in air washers. These micro droplets have evaporation period ranged from 0.190 sec to 0.075 sec. Flash evaporation is better in use when dealing with occupied spaces supply air as it generates better indoor air quality and due to there are no water recirculation in spraying process, there are no possibility for micro-organisms generations in water, moreover fog chambers have high effectiveness and saves water as no need for blow down.

Fig. 2 and Fig. 3 show the schematic flow diagrams of suggested IEDEF cooling systems showing the main components and their related psychrometric process respectively. The flow diagram in Fig.2 shows an open type cooling system where circulated water is cooled via cooling tower. Fresh air will be filtered in three stages starting from sand trap lover and end with high efficiency bag filter and then, Exhausted air from space will exchange heat sensibly with filtered fresh air via air-to air plate heat exchanger as a pre-cooling process, while cold water from cooling tower will be utilized by water-to-air cooling coils "Pure sensible cooling heat exchangers" that reduce treated fresh air dry bulb temperature sensibly, On the other hand the treated air with new low DBT and WBT will enter high efficiency flashing or fog chamber based on adiabatic cooling and then deliver air to the required spaces.

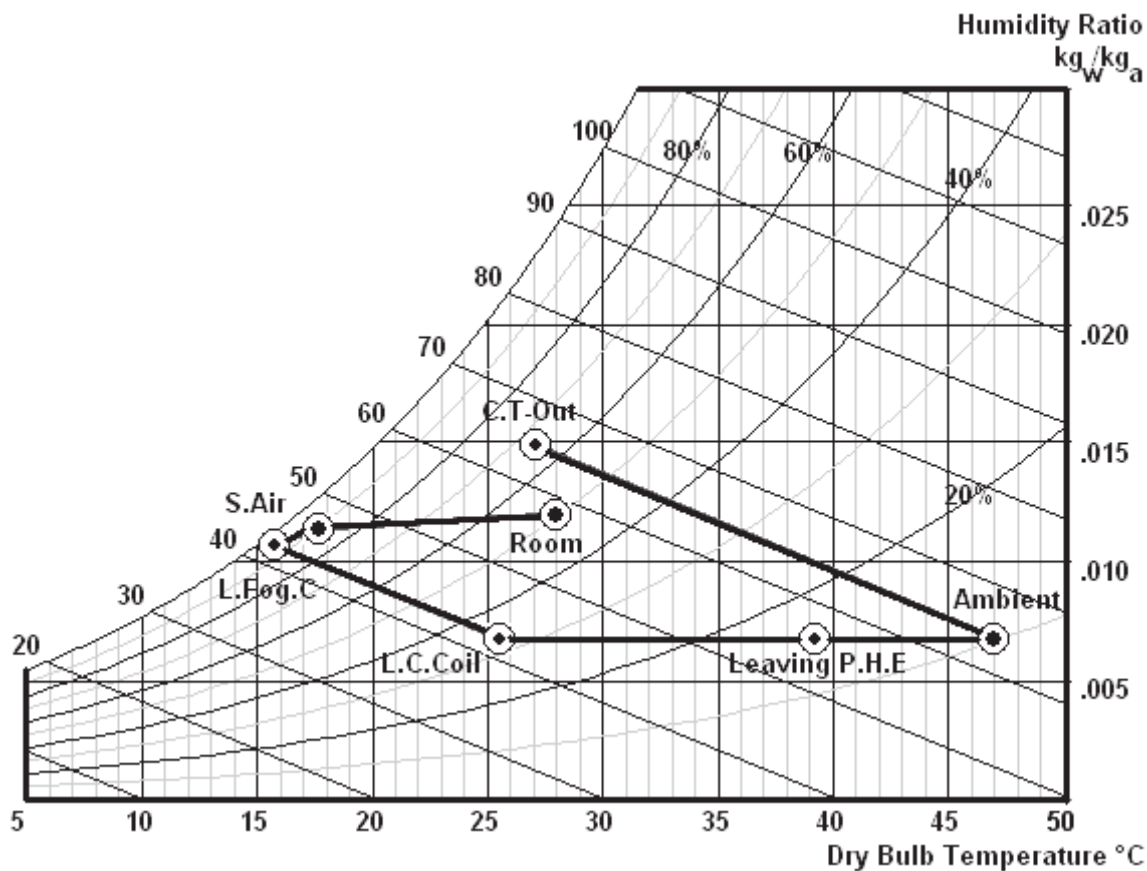


Fig.3
Psychrometric Process of the Suggested IEDEF Cooling System

As indicated in Fig.3 psychrometric process shows that supply air temperature can reach 18.20OC supply air temperature leading to indoor condition about 29.50OC DBT at 47% R.H with total power consumption rate up to 0.42 kW/T.R. This process is valid for room sensible heat factor, RSHF, 85% to 97% and it has the ability to accommodate room conditions 27.0OC to 30.0OC DBT, dry bulb temperature, at 48% to 55% relative humidity with indoor pressurizations to avoid infiltrations that is acceptable for acclimated people in Upper Egypt.

Cooling Tower

Total Heat Rejected	300.00 KW	Water Flow Rate, Max.	10.50 l/s
Inlet Water Temperature.	35.00OC	Circulated Water Flow.	9.820 l/s
Outlet Water Temperature.	24.40 OC	Evaporation Loss.	00125l/s
Design Wet Bulb Temperature.	22.22 OC	Drift Loss.	0.021 l/s
Air Flow Discharge.	6250 l/s	Fan Motor Power.	3.75 KW
Tower Dimension L x W x H	(2.5x1.4x2.4)m	Operating Weight.	1150 Kg

Cooling Tower Circulating Centrifugal Pump

Water Flow Rate.	9.82 l/s	Pump Head.	225 KPa
Pump Motor Power	3.44 KW	Pump Static Efficiency.	80%

Supply Air Fan

Air Flow.	11321l/s	Fan Motor Power.	11.50 KW
Fan Type.	F.C.F	Fan Total Pressure.	300 Pa
Fan Efficiency.	57%	Fan Power.	9.60 KW

Exhaust Air Fan

Air Flow.	10377	Fan Motor Power.	10 KW
Fan Type.	F.C.F	Fan Total Pressure.	250 Pa
Fan Efficiency.	50%	Fan Power.	8.30 KW

Air-to-Air Plate Heat Exchanger (For System Enhancing), (Option)

Primary Inlet Conditions. Flow / DBT / RH%	10377 l/s 28OC / 55%	Secondary Inlet Conditions. Flow / DBT / RH%	11321 l/s 47OC / 10%
Primary Outlet Conditions. Flow / DBT / RH%	10377 l/s 98OC / 34%	Secondary Outlet Conditions. Flow / DBT / RH%	11321 l/s 39OC / 15%
Primary Face Air Velocity.	3.516 m/s	Secondary Face Air Velocity.	4.078 m/s
P.H.E. Dim. L x W x H	(1.5x2x1.6) m	Exchanger Effectiveness.	42%

Indirect Cooling Coil

Total Heat Load.	296 KW	Total Sensible Load.	296 KW
Inlet Water Temperature.	24.50OC	Circulated Water Flow.	9.82 l/s
Outlet Water Temperature.	31.64 OC	Inlet Air Temperature DBT.	47.00 OC
Outlet Air Temperature DBT.	25.56 OC	Inlet Air Temperature WBT.	22.22 OC
Outlet Air Flow Rate.	11321 l/s	Air Face Velocity.	2.478 m/s
Coil Dimension L x W x H	(0.45x2.75x1.5) m	Water Flow Velocity.	1.432 m/s
Coil # Rows, Fins/mm, Circuits	10 / 0.56 / Full	Outlet Air Temperature DBT.	15.30 OC

Flashing, Fog, Chamber

Air Sensible Load Removed.	134.20 KW	Air Latent Load Added.	135.30 KW
Inlet Fogged Water Temperature.	15.30 OC	Fog Flow Rate.	0.15 l/s
Number of Nozzles / Bank.	60	Nozzle Spacing	450 mm
Nozzle Orifice Diameter.	0.2032 mm	Step Down Eliminators	60 mm
Water Pressure.	70 bar	Step Up Eliminators	60 mm
Chamber Dimension L x W x H	1.8x3.0x1.5	Air Flow Velocity.	2.500 m/s
Number of Nozzles Banks.	2-Counter	Field Test Effectiveness	~90%

High Pressure Plunger Water Pump

Total Flow Rate.	0.15 l/s	Pump Head.	70 bar
Pump Motor Power	1.80 KW	Pump Static Efficiency.	85%

Vapor Compression Cycle VCC Cooling Unit

Total Cooling Capacity.	18.39 KW	Total Heat Rejected.	26.76 KW
Inlet Water Temperature.	44.75OC	Circulated Water Flow.	0.15 l/s
Outlet Water Temperature.	15.00 OC	Storage Tank Capacity	20 lit
Operation Period	12-Hours	Power Consumption.	8.37 KW

Tube-In-Tube Heat Exchanger (Option)

Total Heat Transfer Load.	4.104KW	Sec. Inlet Water Temperature.	24.40 OC
Primary Inlet Water Temperature.	49.66OC	Sec. Outlet Water Temperature.	24.50 OC
Primary Outlet Water Temperature.	44.75OC	Heat Exchanger Effectiveness	75%

From previous quick selections of the required equipment for IEDEF cooling system, it could be concluded that the maximum total power consumption will be 38.86 KW, that around 40 KW while the cooling system was able to handle 447.13 KW cooling capacity at the same supply and room air parameters listed for other traditional systems in Table-2. This means that the EER of the whole system could range from 38-to-40 at best outdoor conditions, while power consumption ratings could reach 0.315 kW/T.R.

Incorporating these combinations techniques among water-cooling systems, air-to-air heat exchangers and "micro-mist" fog evaporation chambers, will ensure that HVAC systems will have comparable initial and running costs and life time up to 20-years which is adequate in Egypt and also for small and medium public zones projects ranged from 400.00 KW to 1800 KW cooling capacities.



CONCLUSIONS:

This work outlined many conclusions, which were arrived at, from field studies, collected statistical data for installed projects; the important conclusions can be summarized as:

- 1- The use of water evaporative systems, which have effectiveness's more than 92%, could be used in limited situations at hot and dry climates especially in residential buildings.
- 2- In Upper Egypt, it is impractical to utilize air-cooled direct expansion systems, or water chillers that have higher power consumptions with very low coefficient of performances and consequently low energy efficiency ratio.
- 3- Proposed IEDEF system shows good agreements with the HVAC designers' wishes in tropical climatic zones especially for power consumptions.
- 4- All HVAC systems that exceed 1000 KW in cooling capacity and utilize VCC shall be water-cooled base when used in Upper Egypt zone and shall be implemented in the Egyptian Energy Efficiency Code, EEEEC.
- 5- Electrical requirements for air-cooled cooling systems are around 1.96 kW per T.R., while water-cooled units are around 0.99 kW per T.R.
- 6- On the Egyptian consumer level, air-cooled plants are distinctly more economical than water-cooled plants even for large capacity installations. While, on the International level, the situation is reversed, though water-cooled plants become only marginally more economical than air-cooled plants.
- 7- Till now there is a water restriction with the use of fog chambers, this problem arise from presence of high level of total dissolved solids, TDS, and the resulting nozzles blocking maintenance.
- 8- Design and construction of fog chambers, shall, need more researches and investigations to enhance the performance as up-till-now it reach 92% in laboratory tests.

CHAPTER ACTIVITIES



June 2018

First Annual Iftar Meeting For Our Chapter



July 2018

First BOG Meeting With Committees' Chairs and Co-chairs



July 2018

First Steering Committee Meeting



August 2018

BOG Following Up Meeting With Committee's Chairs



August 2018

Monthly BOG Meeting With Committees' Chairs and Co-chairs



August 2018

Student Awareness Meeting



ASHRAE RAL organization chart 2018-2019

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