

ASHRAE PYRAMIDS NEWSLETTER

September, 2019



**SECOND
EDITION**

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PRESIDENT'S WORD

I'm so glad to be able to welcome everyone back for the 2019-2020 ASHRAE year! This year stands to be exciting, invigorating and educational. Also, very proud to be one of the founders and the second president for AHSRAE Pyramids Chapter; which is one of the successful Region-At-Large, [RAL] Chapters based on fruitful relations between HVAC & R engineers and all the other professions towards building a strong foundation for our society.

I am pleased to complete the ambitious plans of our former president Eng. Ahmed Abdel Ghani, to add more considering and care on the Student-Activities, [SA] Courses, Young-Engineers-in-ASHRAE, [YEA] Continuous Education & Women-in-ASHRAE, [WIA] Activities because they're the present and future and to strive for the enlargement of our members' circle.

As a Board-of-Governors, [BOG], our focus is concerned to enhance the membership growth and support any active "technical" ideas and efficient participation. As president, my goals are to find ways to build a stronger chapter, give back to our members, and to continue to successfully engage our members to build a stronger community.

Amongst preparing for the year of events to come, we also focused on what our board can do to continue to bring together our Owner-Representatives, Engineers, Consultants, Contractors, Sales-Representatives, and all the other disciplines of the trade. We feel that Pyramids Chapter should be the venue in which our industry can meet and discuss what we can do as a community to create more Efficient, Adequate, Economic and Sustainable designs, more opportunities to build client relationships, and more access for our young, up-and-coming engineers to meet top professionals to learn from. In an effort to succeed on these stated goals above, we will continue to do what we can with the chapter Meetings, Seminars, Workshops, Social events to get as much attendance as possible. We give as many people as possible the opportunity to attend our events and thus more opportunity to make connections and build relationships.

Amongst the chapter meetings, our board will also strive to create more of our other events such as Technology-Transfer Seminars, Non-Technical Lectures, YEA-Events, SA-Courses, and more. Finally, I and the board encourage you all to participate in all of the events and show your support, not only for the Pyramids chapter but for our Egyptian community of professionals.



ASHRAE Pyramids Chapter

Presidential Year (2019-2020)

Prof. Ahmed A. Medhat A. Fahim

Professor of Mechanical Power Engineering
Housing & Building National Research Centre
HVAC-R & Fire Engineering Consultant

WHAT IS ASHRAE?

“The American Society of Heating, Refrigerating and Air-Conditioning Engineers.”

ASHRAE, An American professional association seeking to advance heating, ventilation, air conditioning and refrigeration systems design and construction, founded in 1894; it is a global society advancing human well-being through sustainable technology for the built environment, has more than 57,000 members in more than 132 countries worldwide.

WHY TO JOIN ASHRAE?

- Members enjoy access to the world’s largest library of HVACR related to technical information.
- Annual copy of the ASHRAE Handbook.
- Discounts in the bookstore
- Free online access to Science and Technology for the Built Environment research publication
- Connection to ASHRAE global community of professionals
- Committee Involvement
- Opportunities to be part of the change
- Sharing knowledge on a technical committee
- Volunteering at the chapter level
- ASHRAE Foundation
- Career and professional development resources
- ASHRAE Member’s insurance program

ASHRAE TERM OF THE DAY "PAOE"

What is PAOE ? its stands for Presidential Award of Excellence. ASHRAE members and their chapters are the backbone of our Society and play a vital role in achieving its goals and mission. Through their collective efforts, ASHRAE chapters are the global driver of volunteer activity as we strive to meet our goal of shaping tomorrow’s built environment.

Each chapter belongs to a region for e.g. Pyramids chapter belongs to the Region at Large, where its then divided to Sub Region I and Sub Region II. To monitor chapter's performance a scheme is used and known as the PAOE where each chapter has defined goals for each committee to meet every year and as every committee meets its goals it acquires certain points. Each committee gets to see its performance against the same committees in the same region to drive constructive competition and urge chapters to work more on their goals. After the points of each committee are declared by its head. Then its reviewed by the committee chair of the region to verify it. In the end each chapter accumulates a number of points which determines the chapter performance across its peers.

BOARD OF GOVERNORS 2019-2020



Prof. Ahmed Medhat
Chapter President



Eng. Maged Fouad
President Elect & Chapter Secretary
RAL RVC GAC 2016-2019
RAL CRC Organizing Chair 2018-2021



Eng. Ahmed Bolbol
Vice President
RAL CRC Organization member 2018-2021



Eng. Maria Morgan
Vice President



Eng. Ahmad Nour
Treasurer
RAL RVC CTTC 2019-2022
RRL vice Chair



Eng. Ali Yassien
Vice Treasurer



Eng. Ahmed Abd El-Ghani



Dr. Kamal El-Desouky



Prof. Ahmed El-Safty

PYRAMIDS CHAPTER COMMITTEES

CHAPTER TECHNOLOGY TRANSFER COMMITTEE (CTTC):



Eng. Maria Morgan
CTTC Co-Chair



Eng. Sherif Omran
CTTC Chair



Eng. Ashrakat Gaber
CTTC Co-Chair

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.

GOVERNMENT AFFAIRS COMMITTEE (GAC):



Eng. Salah Hassan
GAC Co-Chair



Eng. Fady Mourad
GAC Chair



Eng. Ahmed Bolbol
GAC Co-Chair

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.

RESEARCH PROMOTION (RP):



Eng. Mohamed Naguib
RP Chair



Eng. Ahmed Salah
RP Co-Chair

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.

MEMBERSHIP PROMOTION (MP):



Eng. Sherif Afifi
MP Co-Chair



Eng. Maria Morgan
MP Chair



Eng. Raghda Ahmed
MP Co-Chair

Membership Promotion Committee publicizes the aims, activities, achievements, and scientific and educational purposes of the Society to encourage qualified persons to apply for membership. The committee also monitors the Society's membership demographics and, where appropriate, adjusts or creates programs to ensure that individuals from all demographic backgrounds are being equally attracted to ASHRAE. This committee reports to Members Council.

MEMBER GRADE FOR THE DEVELOPING ECONOMIES PROGRAM

	Description	Dues	Benefits
Member	Member Grade is open to anyone who has a combination of education, professional licensure and work experience equivalent to twelve years in the HVAC&R industry.	\$110 annually	• Digital subscription to the ASHRAE Journal and quarterly High Performing Buildings (HPB) magazine • An annual revised copy from the four-volume ASHRAE Handbook series in PDF format
Associate	Associate Grade membership is for those who have been in the industry for a few years and are focused on developing skills, and growing their network. Associate grade membership is open to anyone who has an interest in matters of design, operation, or maintenance in HVAC&R-related fields.	\$110 annually	• Free online access to the Technology Portal, and Science and Technology for the Built Environment • Discounts on publications, courses, standards, and conference registrations • Can hold office and vote at Chapter, Regional and Society level.
Affiliate	Affiliate grade is a low cost, introductory membership for new members only who are either: (1) under 30 years of age OR (2) who have been honorably discharged from the Military within the past 5 years, can only hold this grade for up to 3 cumulative years	\$30 (1st Year) \$45 (2nd Year) \$55 (3rd Year)	• Digital subscription to the ASHRAE Journal and quarterly High Performing Buildings (HPB) magazine. • Free online access to the Technology Portal, and Science and Technology for the Built Environment.
Student	Student membership is designed for engineering students who may be considering a career in HVAC&R. Student members are given the opportunity to transfer to Associate grade membership after graduation.	\$15 annually	• Discounts on publications, courses, standards, and conference registrations.

STUDENT ACTIVITY (SA):



Eng. Ali Haridi
SA Co-Chair



Prof. Ahmed El-Safty
SA Chair



Eng. Eman Ellawah
SA Co-Chair



Ahmed Khallaf
SA team leader

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.

YOUNG ENGINEERS IN ASHRAE (YEA):



Miss. Lina Maged
YEA Co-Chair



Eng. Nadia Ali
YEA Chair
RAL ARVC YEA 2018-2020



Eng. Mohamed Ali
YEA Co-Chair

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

REFRIGERATION COMMITTEE:



Eng. Maged Fouad
Refrigeration Committee
Co-Chair



Eng. Mohamed Seif El-Nasr
Refrigeration Committee Chair



Eng. Mohamed Amer
Refrigeration Committee
Co-Chair

Refrigeration Committee encourages the advancement of refrigeration technology and its application. This committee reports to Technology Council. Through its use in refrigeration and air conditioning systems, the refrigeration process is critical to health, comfort, and welfare of humanity. The Refrigeration Committee of ASHRAE encourages the advancement of refrigeration technology and its application.

ELECTRONIC COMMUNICATIONS COMMITTEE (ECC):



Eng. Fady Kamal
ECC Chair
RAL ARVC ECC 2018-2020



Ahmed Khallaf
ECC Co-Chair

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.

K-12/STEM:



Arch. Eman Ellewah
K-12 Chair



Eng. Abd El-Raouf
K-12 Co-Chair

ASHRAE's K-12/STEM subcommittee works to advance awareness, understanding and appreciation of science, technology, engineering, and math (STEM) in the K-12 student population.

WOMEN IN ASHRAE:



Miss. Lina Maged
WIA Chair



Eng. Fourat Moussa
WIA Co-Chair

The mission of the Women in ASHRAE committee is to promote the addition and retention of women in the built environment by encouraging opportunities for professional development and leadership. We strive to unite women from various occupations including engineering, construction, project management, property development & ownership, equipment sales & manufacturing, architecture and more. We hope to foster mentoring relationships among these professions to create a network of women supporting women in our Region.

HISTORICAL COMMITTEE:



Eng. Nadia Ali
Historical Co-Chair
RAL ARVC YEA 2018-2020



Eng. Mohamed Ali
Historical Chair



Eng. Esraa Mehany
Historical Co-Chair

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.

NUMERICAL MODELING OF AIR FLOW REGIMES INSIDE BUILDING LIGHT-SHAFTS

Prof. Dr. Ahmed A. Medhat A. Fahim

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ABSTRACT

Common old and new residential buildings designs in Cairo show the presence of internal light-shafts on which, internal enclosed rooms or utilities “i.e. kitchen, closets, etc.” is opened on these shafts in order to produce natural air-flow draft within each apartment and day-lighting. These air-flows enable to scavenge air contaminations and pollutants from such utility spaces and also produce a pleasant fresh air circulation inside internal rooms in addition to moderate day-lighting.

Site surveys show that tenants use split-type room-air-conditioners tremendously with the increase of outdoor pollutions, temperatures, and dust. As local codes and laws did not allow installation of outdoor condensing units on building main façades, users began to install these units on (1) Side or Back facades or (2) Inside the internal light-shafts, leading to destroying the light-shaft function and produce unpleasant noise to adjacent buildings and within the building itself. Both installation cases had bad impact, First, Light-shaft become useless, Second, Operation of air-conditioners together makes the light-shaft very hot leading to decrease the Energy Efficiency Ratio, EER of units. Thirdly, Noise claims from most of neighborhoods living in adjacent building or spaces. Present study focuses on specifying the main parameters affecting internal light-shafts functions and its properties.

Current investigations were accomplished for simulation purposes using Computational Fluid Dynamics, CFD. Simulations were carried out on three conceptual designs for the conventional internal light-shafts located in different building Heights. Methodology of numerical simulations was validated through field measurements on three decades residential building cases in Cairo. Evaluations show a good agreement among physical measurements and numerical modeling and introduce some recommended affecting parameters for these internal light-shafts that could be considered in the updated Egyptian Construction Local Codes, ECLC. These parameters enable the installation of split units inside light-shaft and keep the Energy-Efficiency-Ratio, EER steady in addition to providing efficient natural ventilation during winter and intermediate seasons.

1. INTRODUCTION

This paper is part of national project started after 25th January revolution to re-evaluate all building codes and special regulations for the development purposes and to adopt these construction laws according to the climatic regions, natural resources, citizen nature and life style, distribution of populations and densities and the future visions for next 50-Years.

The past fifty years show great changes and development in building construction laws, codes and implementing regulations according to the community and housing needs. During years of 1930th and till years of 1960th Cairo was famous internationally with palaces, villas, prestigious classic houses, and aristocratic building including full separation among occupied applications. Those buildings are characterized by footprint area ranged from 25% to 35% from land use and rise to maximum seven stories based on floor height over 4.00 m. It was constructed based on thermal mass effects via its bearing walls. The shading area among group of buildings was sufficient enough to have horizontal spacing more than 14.00 m. Such buildings were famous for good natural ventilation, perfect acoustics, adequate indoor environmental quality and excellent protection from smells and odors transfer from building utilities due to the efficient operation of internal light-shafts, which generate enough draft, enable good air circulation from outdoor perimeter. Those construction parameters were collected from site surveys and could be concluded to the common rules and practices.

3. CODES & REGULATIONS HISTORY

History of the implemented codes, [1] regulations and common practices could be summarized herein after as follows according to the historical periods.

Constructions before 1960th, [2]

<u>Utility Shafts</u>	Bldg. Height $\leq$ 10.0 m	Shaft Area $\geq$ 10.0 m ² @ Min. Dim $\geq$ 3.0 m
	Bldg. Height $\leq$ 20.0 m	Shaft Area $\geq$ 15.0 m ² @ Min. Dim $\geq$ 3.5 m
	Bldg. Height $\leq$ 30.0 m	Shaft Area $\geq$ 20.5 m ² @ Min. Dim $\geq$ 4.0 m
<u>Rooms Light-Shafts</u>	Minimum Dimension = [Bldg. Height / 4] and not less than 4.0 m	
	Minimum Area = [Bldg. Height / 3] and not less than 12.0 m ²	

At the middle of years 1970th there were housing problems, [3] as the available dwelling units are not enough for the populations and the expected population growth for the next 20-years from that date. During this periods many different regulations were stated for each governorates and re-adapted and for some cases it was withdraw and re-stated again till years 1980th, it could be concluded as follows:

Old construction law from 1972 – 2009, [4]

<u>Utility Shafts</u>	Bldg. Height $\leq$ 10.0 m	Shaft Area $\geq$ 7.50 m ² @ Min. Dim $\geq$ 2.5 m
	Bldg. Height $\leq$ 20.0 m	Shaft Area $\geq$ 10.0 m ² @ Min. Dim $\geq$ 2.5 m
	Bldg. Height $\leq$ 30.0 m	Shaft Area $\geq$ 12.5 m ² @ Min. Dim $\geq$ 2.5 m
	Bldg. Height over 30.0 m every additional +10.00 m	Add Area +2.5 m ²
<u>Rooms Light-Shafts</u>	Minimum Dimension = [Bldg. Height / 4] and not less than 3.0 m	
	Minimum Area = [Bldg. Height / 3] and not less than 9.0 m ²	

At year 2009 a new construction code was stated by law and approved from the people of assembly to be implemented having major changes that should meet the nature of the Egyptian citizens and the booming in using the unitary air-conditioners which became part of life for at least eight months yearly.

This code was summarized as follows:

New Construction Law after 2009, [5]

Utility Shafts Similar to Old Construction Laws and regulations dated from 1980 – 2009

Rooms Light-Shafts Minimum Dimension = [Bldg. Height / 4] and not less than 3.0 m
Minimum Area = [Bldg. Height / 4] and not less than 9.0 m²

This paper will focus on the parameters affecting internal Light-Shafts design for residential indoor environmental quality, IEQ within new constructions. Those parameters are devoted to the flow regimes inside shafts and the impact on its functions, especially when air-conditioners are installed inside it.

4. PROBLEM IDENTIFICATION

In recent years tenants started to use split-type room-air-conditioners in wider ranges especially in Cairo, with the increase of outdoor pollutions, temperatures, and dust. As local codes and laws did not allow installation of outdoor condensing units on building main façades, users began to install these units on side or back facades or inside the internal light-shafts. The latter is leading to destroying the light-shaft functions or produce unpleasant noise to adjacent buildings. Both installation cases had bad impacts, First, Light-shaft become useless, Second, operation of air-conditioners together makes the light-shaft very hot leading to decrease the Energy Efficiency Ratio, EER of units, [6]. Thirdly, Noise claims from most of neighborhoods living in adjacent building or spaces.

Inherent and existing problems declared in Egyptian courts among building (A) owners, building (B) tenants and the manufacturer of installed air conditioners at building (A) Tenant at building (B) were claimed due to the noise generated and amplified within the buildings spacing, while owner of building (A) was claimed due to the very bad performance of the installed air conditioners. Finally after changing the location of some air-conditioners from the side façades to the internal light-shafts the manufacture of such split room air conditioners is claiming from the extra services and repairs for burnt condensing units during the guarantee period.

Technical investigations were carried out on this case to introduce suitable solutions. Temperatures and heat measurements have been carried out using test kit Swema-II model Acs-500 while surface temperatures were measured using heat flux sensors [Heatex-EXDR204], (0 - 750 W/m² +/-5%) and temperature transducers [Transistor LM35xn], (-10.0 - 150.0°C +/- 0.10°C), data acquisition module [Lab Jack 12-Bit] was used to collect and manipulating data via connection to a PC computer operated with Lab-View Ver-7.0.0 custom made software. Table-1 shows the brief indicators of the measured temperatures on side facades and internal shaft of Building (A).

Table. 1 Measured Temperatures at Buildings “A and B”

Floor	Measured Temperatures During August @ 5:30 PM				AMB.
	Surface Bldg. A	[1 / 3] Dist.	[2 / 3] Dist.	Surface Bldg. B	
Gr .FFL	38.56	41.56	41.21	36.23	34.00
5 th .FFL	37.45	41.22	42.00	36.00	34.12
6 th .FFL	39.22	42.40	43.08	35.82	34.00
Internal Shaft	Avg. 42.08	Avg. 44.76	Avg. 45.38	N.A.	34.00

Noise measurements have been carried out according to ASTM-E-1574 and the Equivalent continuous sound level in $db[A] = (L_{Aeq})$ was calculated. The equivalent continuous sound level is steady sound level which would produce the same energy over a given time period (T) as a specified time varying sound measured using [A] weighting network while, [A] weighting is commonly used to simulate the frequency response of the human ear.

Sound measurements and instrumentation that have been used for measurements are Bruel & Kjaer Sound level meter type 2260 with Microphone type 4189. The acoustic measurements were executed firstly for Sound pressure level at octave band center frequency from 63 Hz to 8 kHz at each room within 5th and 6th floors, Secondly the $db[A]$ – weighted equivalent continuous sound level in each room were calculated and re-measured.

Table 2 shows the sound pressure levels measurements at octave frequencies from 63 to 8000 Hz and the determined $db[A]$ at each room with summarized measured noise rating, equivalent A-weighted sound pressure level, L_{Aeq} in each room when air conditioners are turned on.

Table. 2 Measured Sound Octave Band at Building “B”

Floor	Octave Band Measured Frequency Hz								L_{Aeq} db[A]
	63	125	250	500	1000	2000	4000	8000	
Gr .FFL	61.95	54.61	46.41	40.69	36.25	33.90	29.36	26.38	43.02
5 th .FFL	75.69	64.44	68.20	63.74	58.87	54.68	51.29	40.64	64.16
6 th .FFL	65.07	57.27	57.85	46.27	39.17	34.77	29.37	20.97	56.20
Internal Shaft	74.55	66.04	61.33	63.73	60.88	50.32	55.62	52.92	68.67

5. METHODOLOGY & MODELING VALIDATION

This paper describes numerical modeling with the aid of computational fluid dynamics, CFD for different light-shafts arrangements. This CFD enables us to evaluate the internal environments inside light-shafts. The methodology of the applied numerical modeling was based on using 3DHVAC-Code, [7], which was validated with the aid of field and experimental measurements for results-quality- assurance. Gained CFD results were compared with similar results gained from another CFD commercial code such as ANSYS-Fluent Ver.6.3, [8] to consolidate its results especially for Grid-Results independent, meshing sizes, types, and shapes, boundary conditions, number of iterations, iteration per time-step, used solver and suitable turbulence models. Finally, Classifications of shaft types and sizes were stated and according to old and new local regulation. Twenty-five case studies were established for this investigation. Present work will focus's on four cases only.

6. CASE STUDIES

Table 4 show the different case studies that were applied to CFD modeling. Those cases represent different building heights with different arrangements of installed outdoor units of the room air-conditioners.

7. RESULTS & DISCUSSIONS

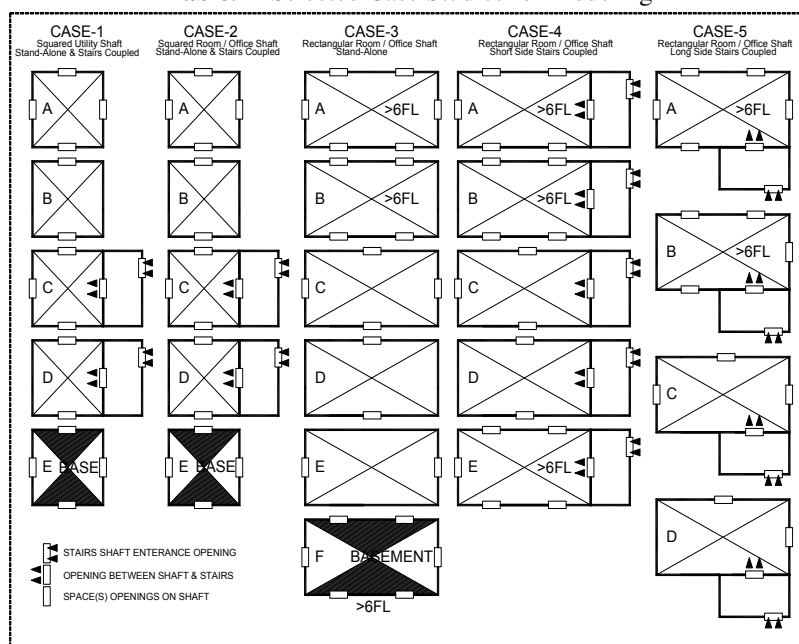
Due to the great amount of data and CFD figures, the reader may refer to the website of the ASHRAE Pyramids Chapter for detailed results and in this part only sample will be introduced. Figure 1 shows at L.H.S the layout of 6.5m x 4.5m light-shaft connected to the building entrance having 4.5m wide x 3.0m height while 22-outdoor units are located inside and at middle is the Y-Z Mid-section for velocity contours when all A/C units are operated continuously for one hour, and at R.H.S is the X-Z Mid-section for velocity contours.

8. CONCLUSIONS

The work presented in this paper has many implications for the proper use of Light-shafts from thermal aspects, while there are other aspects shall be investigated such as day-lighting, acoustic problems and treatments. It has been believed that it was not possible to install A/C units inside such shafts but with different CFD modeling trials, the main affecting parameters on shaft design could be summarized as follows:

- Light-Shafts cross section area.
- Light-Shaft Aspect Ratio.
- Ratio of Bldg. Height to Shaft Minimum dimension.
- Ratio of Bldg. Height to Shaft cross sectional diagonal.
- Location and Arrangements of Installed A/C units
- Presence of openings on the adjacent patio, or stair case.
- The External effects of shaded pedestrians around Bldg. and any other building fabric that may produce air flow through Bldg. entrance.
- The suitable ACH that shall not exceed 40-ACH.

Table. 4 Selected Case Studies for Modeling



From the gained results, one can conclude that the cold airside feeding outdoor units have a strong influence on the velocity and temperature distribution and consequently on the local flow regimes at each floor level independently. The location of supply hot air outlets plays the major role in his Jet distribution. These ports should be located in the right location to correct the errors of the bad selection of the A/C outlet positions.

As a Result of the architectural design restrictions designers may be forced to incorporate a certain design that is seen to yield better air flow, temperature, relative pressure behavior .The restrictions of the architectural and civil engineer to use a large shaft cross section area hinders attainment of good function of the Light-Shafts.

Finally, It is important to review and re-adapt the Egyptian Uniform Construction Codes according to the climatic regions and with the aid of Urban Tissue Designers, Civil Defense, Architect Design and Mechanical – Building Physics Engineers. These recommendations are considered as initial approach for this vital subject and shall be forwarded to the Authority having Jurisdictions including all assessment engineered justifications.

9. REFERENCES

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- [2] List of Codes, Regulations, and Building Laws before Year-1960, Published by The Local Agency of Hotel and Tourist. Al-Amerya Press, Cairo.
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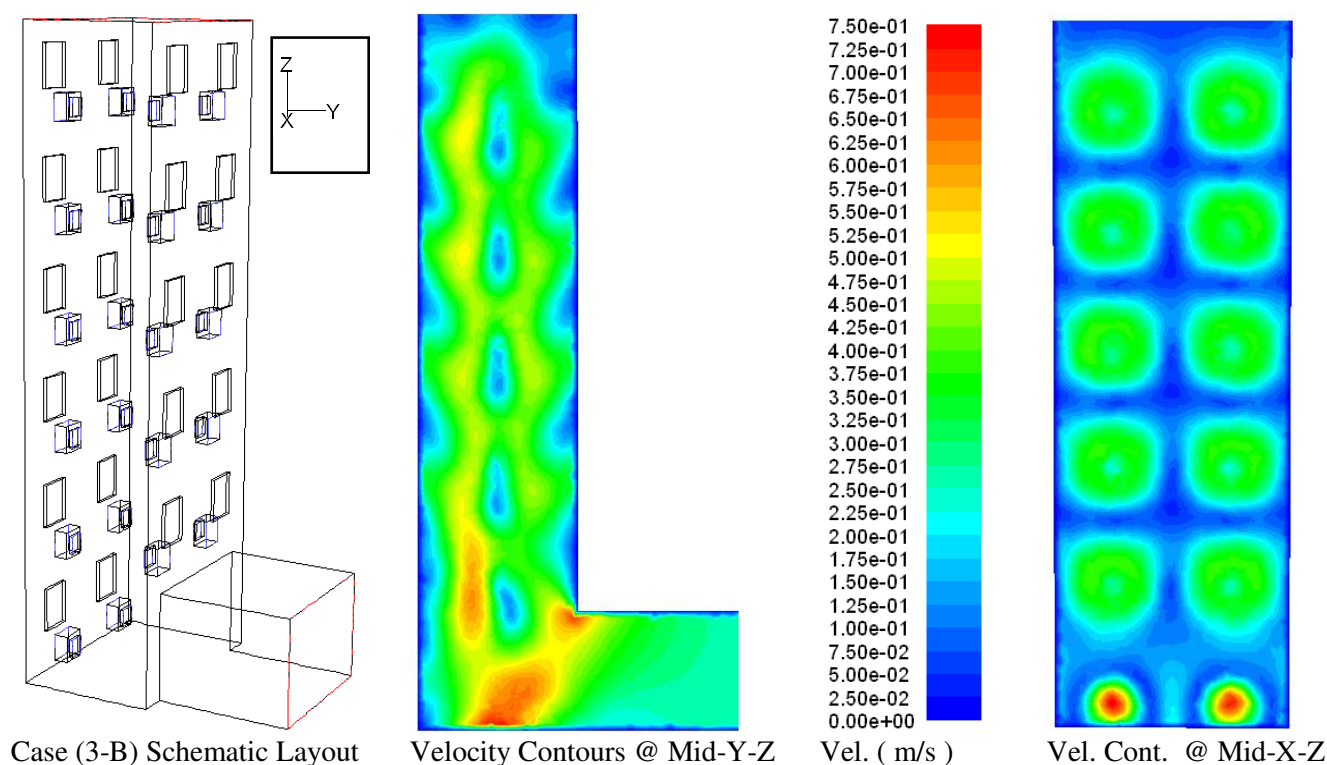


Figure. 1 At L.H.S, Modeled A/C Units Installation Case, 4-Units per Floor, all Units are operated.
At R.H.S, Colored Velocity Contours in (m/s) At X-Z & Y-Z Sections

ABOUT THE AUTHOR

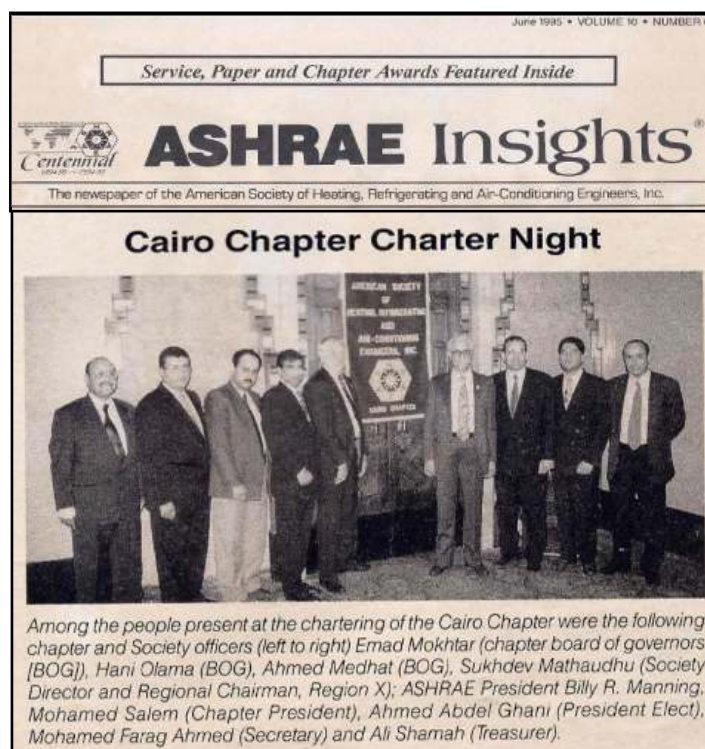
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Professor of Mechanical Power Engineering
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THE BIBLIOGRAPHY

Prof. Ahmed A.Medhat A.Fahim is a Full Professor of Mechanical Engineering and Official Consultant at the Architect and Housing Institute, [AHI] at Housing & Building National Research Centre, [HBRC] , Past Director of the Electro-Mechanical In Buildings Institute, [EMBI] and Head of the MEP Technical Governmental Reviewers Committee at UTI-Institute at HBRC. HBRC is an Egyptian governmental body, since 1954, where all building codes and implementing regulations are prepared and published. He was graduated from the Faculty of Engineering at Cairo University at 1988 and got his M.Sc and Ph.D from the same university at 1993 and 1999 respectively. He started his HVAC career at 1985 before graduation as a trainee at KOLDAIR company which was one of the biggest and oldest HVAC equipment manufacturer and contractor that related to the Governmental Public Sector and after graduation he continue working till 1998 at KOLDAIR. After getting his M.Sc.. He works for many international consulting firms for the design and supervision of different HVAC projects in the Middle East. During 2002 HBRC elected him to join the field researchers team as a mechanical researcher and certified consultant for HVAC and fire engineering

to participate in the developments of the HVAC and fire codes, in addition to that, He has been participated in preparation of Energy Efficiency Codes and the Green-Pyramid-Rating-System, GPRS for sustainable buildings design and evaluation. During the last Twenty years he has published more than sixty papers in international journals and conferences that are devoted to HVAC energy efficiency, development of indoor environmental quality and fire engineering.

Prof. Ahmed has established his private consulting firm during 1992 that named LUUKKI, Egypt "SFPE, NFPA, USGBC Certified", such firm is working for both of Prescriptive and Performance-Base designs and supervisions for different HVAC and Fire-Engineering Design projects. Now, LUUKKI has more than 25 years' experience in Egypt, Middle-East working for the design, CFD predictions, field tests with all applications of smoke-control & related fire engineering systems and strategies, in addition to HVAC and climate control systems in buildings. LUUKKI become accredited Fire-Engineering & Smoke-Control Consultant firm, develops and conducts a series of smoke-control seminars for HBRC, TUV, GTZ, ASHRAE Cairo-Chapter, ASHRAE Pyramids-Chapter, Egyptian Fire Protection Association. Prof. Ahmed was one of the Co-Founders of ASHRAE Cairo-Chapter and BOG for 10-Years since the establishment of this chapter at June 1995. Finally, during the last 15 years, Prof. Ahmed "LUUKKI Director" conducted more than 30 technical articles in Fire-Engineering researches for HBRC. He is one of the authors of the HVAC & Fire-Safety-&- Protection-Codes. He has had input into various Standards, Codes, Regulations and is currently sitting on HBRC Committees for Fire Safety, Fire Engineering and Smoke Control along with a number of Egyptian Code Committees.



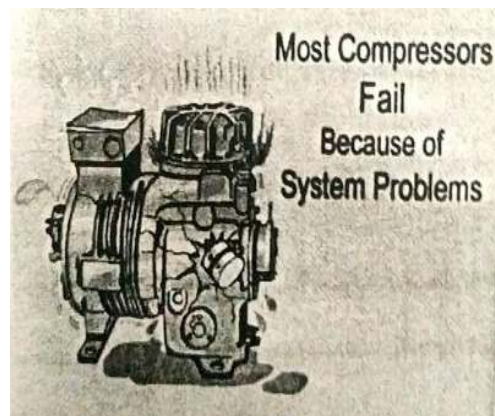
COMPRESSORS' CAUSES OF FAILURE

Eng. Mohamed Seif El-Nasr

Business Development consultant (Refrigeration and A/C) industry since 1978

Director MG Impex

One of the biggest problem in the field is that we don't analyses and detect the failure we just replace the compressor and in many cases unfortunately we do not install the right compressor due to the wrong selection and lake of cross reference between the different brand by using the term HP to replace the compressor without thinking of the displacement or the compressor design LBP or HBP many parameters have to be taken care of.



ELECTRICAL FAILURES:

ELECTRICAL FAILURE IS OCCURRING DUE TO:

1. Phase losses
2. Phase reverse
3. Low or imbalance voltage.

AND THE REMEDIES FOR THESE FAILURES ARE:

1. Proper design of electrical panel.
2. Phase sequences

MECHANICAL FAILURE

THE MECHANICAL FAILURE OCCURS DUE TO DIFFERENT REASONS:

Wrong compressor application;

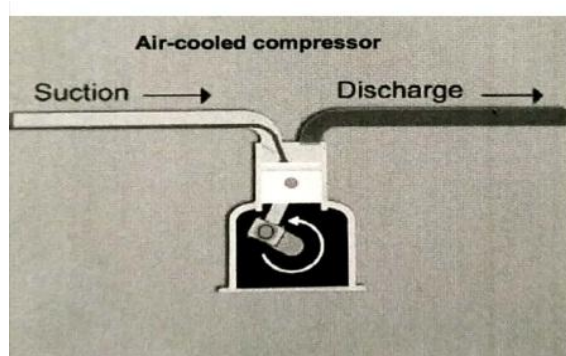
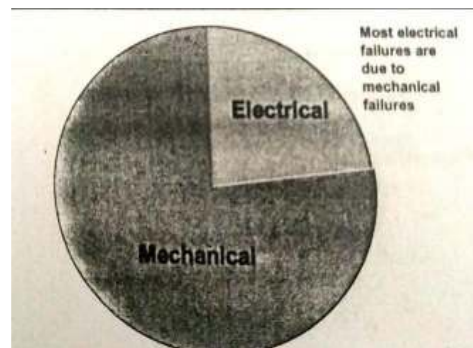
1. running outside limits and envelopes.
2. Low capacity increase compressor runtime.
3. Higher capacity could also affect the compressor (Short cycle and low load conditions).
4. Selection of the right system components

MAIN REASONS WHY A COMPRESSOR FAILS:

1. REFRIGERANT FLOOD BACK

Defined as liquid refrigerant returning to the compressors during the running cycles. Typically occurs when the liquid control device has lost control of the liquid refrigerant being fed into the evaporator.

The resulting damage is determined by the type of compressor, refrigerant or air cooled.



CAUSES:

1. Overheating on capillary tube systems.
2. Insufficient thermal transfer.
3. Improper air flow due to plugged filters, fan motor failures or inadequate air circulation
4. Low secondary heat transfers due to dirty, frosted or oil logged evaporators.
5. Sudden load changes.
6. Hot gas or reverse cycle operation, door switches.
7. Incorrect sized or installed expansion device.
8. Faulty expansion device.



The lubrite coating on piston has been worn off

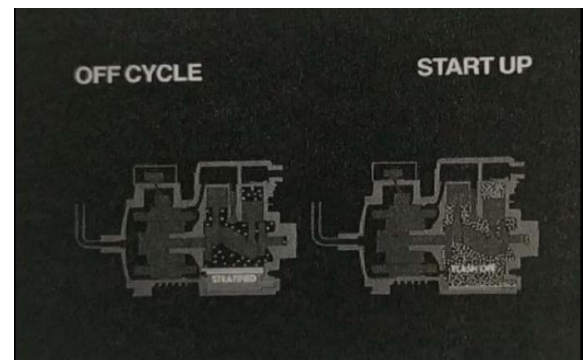
Damaged parts: Connecting rods

2. FLOODED START

CAUSES:

Eruption of refrigerant as start up in stratified oil / liquid refrigerant mixture in the compressor sump.

Due to refrigerant migration during the off cycle, liquid refrigerant in the evaporator vaporizes and moves as a vapor to the crankcase. The vapor condenses and is absorbed by the oil. The difference in the vapor pressures of the refrigerant and the oil will determine the rate of migration. Applicable to both refrigerant and air cooled compressors.



REMEDIES:

1. Solenoid valve.
2. Pump down cycle.

3. LOSS OF OIL

The key sentence is “Oil return must equal oil leaving”.

CAUSES:

1. Incorrect pipe sizing
2. Improper traps
3. Loss of charge
4. Short cycling (inadequate runtime for oil return)
5. Low loads or capacity controlled systems resulting in low suction gas velocity
6. Pressurized crankcase in suction cooled compressors

REMEDIES

1. Oil and refrigerants management system
2. Install oil trap; S Trap or p trap on the riser, pipe network size and length till 35 m no need to change the pipe size
3. Design of right piping network discharge, liquid, suction.
4. Oil separator right size.
5. Suction accumulator right size, CCH and rise expansion capacity redeem TEV.



P Traps (reduction in flow area = increased velocity)



Suction Accumulator

4. OVERHEATING

The generation of heat due to motor losses, friction and heat of compression are all considered in compressor design

Extended periods of operation outside these limits will harm the compressor.

Overheating leads to reduced oil lubricity and in some cases to eventual breakdown and carbonization.

Discoloration is the main evidence of overheating.



CAUSES:

1. High compression ratio.
2. High return gas temperature.
3. Lack of external cooling (fans, water coil or liquid injection devices).
4. Over charges.
5. Air in the system (non-condensable gas).
6. **High discharge temperature** will affect the oil lubricity, selection of the right oil according to the manufacturer's recommendations.
7. Finally, the damaged parts in the compressor will show exactly what went wrong during operation.



Reduced oil

BUILDING INFORMATION MODELING (BIM)

Eng. Mohamed Nabil
Founder of SBS Smart Building Solutions
engineering & consultant

WHAT IS BUILDING INFORMATION MODELING (BIM)?

Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. It is a smart model-based process that gives construction field professions the tools to capture, explore, and maintain consistent and coordinated different phases of the construction process.

It is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition. BIM, also, helps in the documentation, analysis, and renovation processes.



WHAT MAKES BIM TECHNOLOGY A GREAT STEP TOWARDS THE FUTURE?

There are huge differences between traditional building design's techniques and BIM using its different level of dimensions. BIM technology provides its users with greater project insight for cost, schedule, and constructability. Using BIM technology, the connected workflow enhances productivity and predictability. Besides, it enables prompt response to change with processes that are smarter and faster.

WHAT ARE THE TOP BIM BENEFITS?

1. BETTER COMMUNICATION

Digital BIM models are sharable. Thanks to the high level of coordination, this technology allows many users to work at the same time on the same file to cut waiting time and avoid double work; furthermore, provides better control over technical decisions.



2. MODEL-BASED COST ESTIMATION

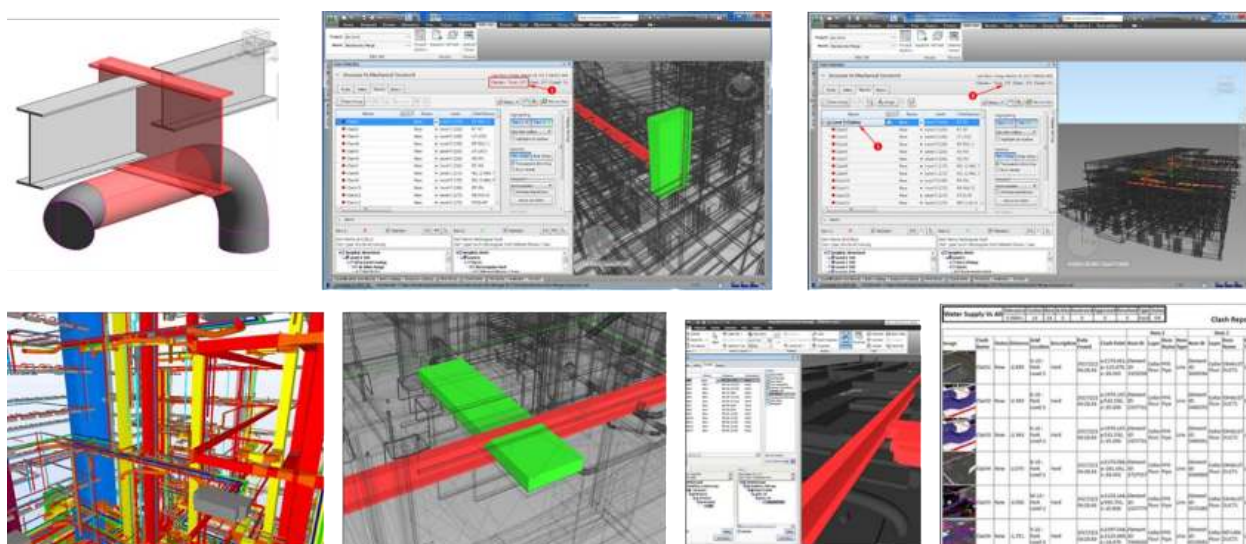
When it comes to productivity, BIM is also considered as a smart solution, which accurately estimates the needed number of labors and materials; thus, it increases efficiency, reduces labors' demand, and reduces material waste.

3. PRECONSTRUCTION PROJECT VISUALIZATION

Using BIM, every single detail in the model is obvious, reachable, and editable. This is because of the improved visualization level that is reached using such a technology.

4. PROPER COORDINATION AND CLASH DETECTION

BIM technology offers a variety of programs that smartly work to figure out any type of clashes. These clashes can be between different disciplines or/and elements in the same disciplines. All the engineering disciplines work on the same model, so they can easily figure out any clashes in the model between the different disciplines. Moreover, using this smart 3D model-based process helps in predicting future problems, which effectively saves time and money.



5. SCHEDULING

Documentation is directly done during design and automatically changed throughout the designing phase. It is an interactive process in which calculations of quantities happens directly during drawing.

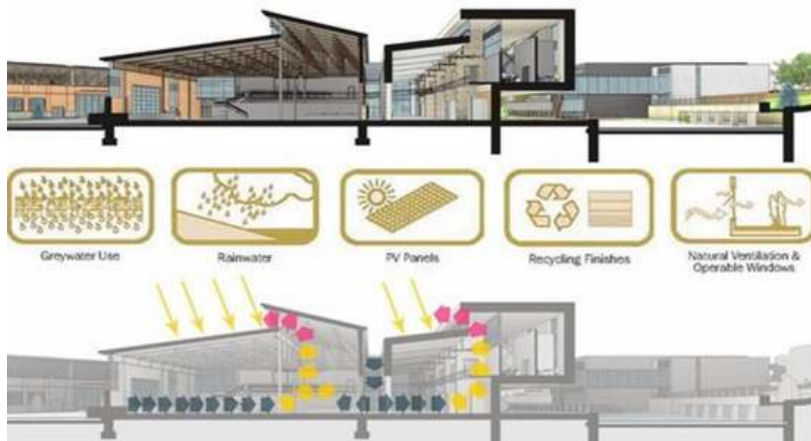
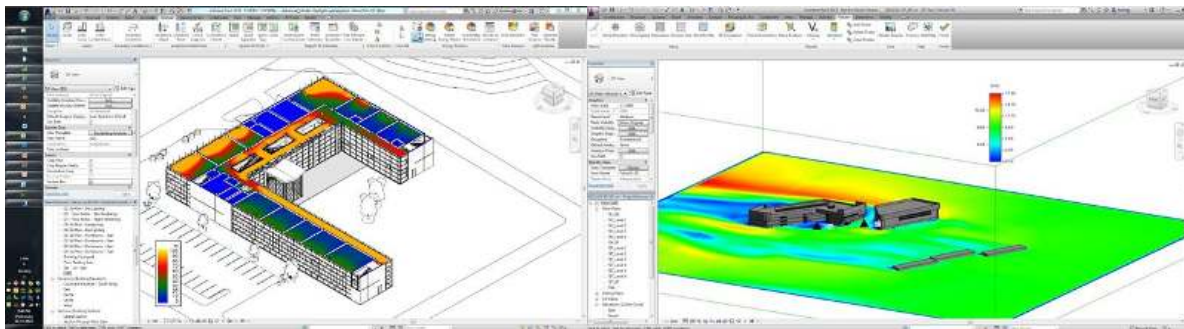
									
1. GENERAL DATA 1.1. Project Name: Road Construction and Pavement Improvement Project 1.2. Location: District of Zvezdarski, City of Belgrade 1.3. Client: Directorate for Urban Planning and Construction Management of the City of Belgrade 1.4. Design Office: "Urbanistica" d.o.o. 1.5. Scale: 1:500 1.6. Date: 15.05.2024.				2. EXISTING CONDITIONS 2.1. Topography: The area is characterized by a gentle slope towards the south-east. 2.2. Vegetation: There are scattered trees and shrubs along the route. 2.3. Utilities: Existing underground utilities include water, sewer, and electricity lines. 2.4. Adjacent Properties: The route is bordered by residential and commercial buildings. 2.5. Current Road Status: The existing road is in poor condition, with uneven pavement and narrow lanes.					
3. PROPOSED SOLUTION 3.1. Road Width: 12.00 m 3.2. Lane Width: 3.00 m 3.3. Shoulder Width: 1.50 m 3.4. Pavement Type: Asphalt concrete 3.5. Drainage System: Side drains with a slope of 0.5% towards the ditch.				4. ENVIRONMENTAL IMPACT ASSESSMENT 4.1. Noise: The proposed road will increase noise levels in the surrounding area. 4.2. Air Quality: Increased traffic will lead to higher levels of air pollution. 4.3. Visual Impact: The new road layout will change the visual character of the area. 4.4. Ecology: The construction and operation of the road will impact local flora and fauna.					
5. CONCLUSIONS The proposed road construction and pavement improvement project is technically feasible and meets the required standards. It is recommended that the project be implemented as planned, with appropriate measures to mitigate environmental impacts.				6. RECOMMENDATIONS - Implement noise barriers along the road. - Plant trees and shrubs to improve the visual environment. - Regular maintenance of the road and drainage system.					

6. SAFER CONSTRUCTION SITES

BIM technology helps in enhancing safety during construction by pinpointing hazards during the design phase. To avoid physical risks, BIM users use visualizing and planning site in the different construction field.

7. BIM AND SUSTAINABILITY

Energy analysis simulation can be conducted on 3D models using BIM technology, after getting your model ready. In BIM technology, every building component consists of layers, which present the layers in reality. While adding materials to any building component layers, the thermal mass and resistance are changing. Even while replacing any of the chosen materials, the thermal mass and resistance will also change. Not only walls but also floors, roof, and any building component consist of layers to add materials and get the accurate total thermal mass and resistance. Therefore, the heating and cooling loads will be accurately calculated during the design phase. Furthermore, BIM programs recommend some changes, using graphs, to reduce energy consumption. These recommendations might be minor or major according to the location, orientation, building components, etc.

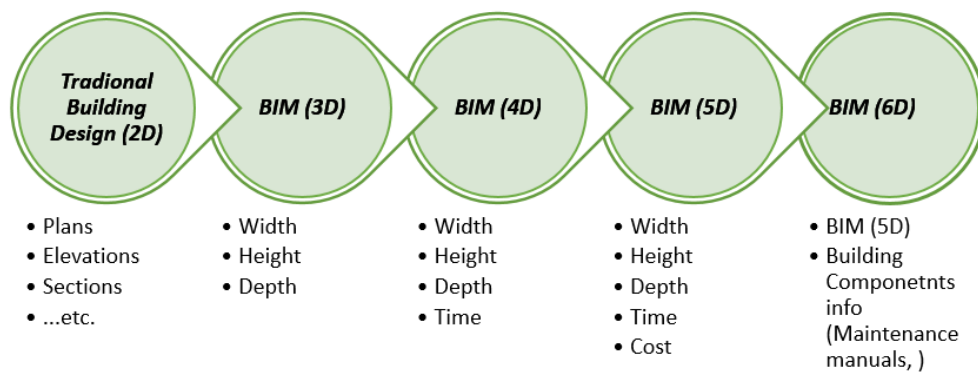


**TWO
THAT
CONSIDER WHILE USING BIM TECHNOLOGY IN YOUR PROJECT:**

**MAIN POINTS
YOU SHOULD**

BIM DIMENSIONS

BIM technology has a new vision that went further than the traditional two-dimensional models.



3D: THREE-DIMENSIONAL RENDERING OF THE ARTEFACT

An intelligent 3D model-based process that gives efficiently plan, design, construct, and manage buildings and infrastructure.

4D: DURATION ANALYSIS

Time management represents a fundamental aspect in construction planning.

5D: COST ANALYSIS

The focal point of 5D BIM is the “Quantity Take Off”, which consists in the measurements extraction from a project to define the material/s quantity necessary for one or more elements modeling.

6D: SUSTAINABILITY ASSESSMENT

The 6D model is usually delivered to the owner when a construction project is finished. "As-Built" BIM model”.

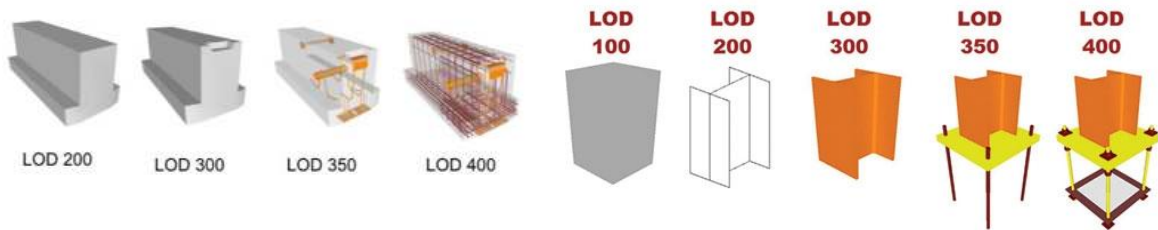
7D: MANAGEMENT PHASE OF WHAT HAS BEEN ACHIEVED

The generated “model” must include the transmission of the information database; we certainly cannot disregard maintenance and dismantling aspects or the renovation of the building work.

LEVEL OF DETAILS

BIM technology offers a variety of drawings’ details level to meet the requirements of the current stage in every project. For instance, the schematic drawings require fewer details than the as-built drawings.





CONCLUSION

BIM helps designers use an integrated design approach, where they think in systems and not isolated components. It is a direct proof of how focusing on isolated components only can negatively affect the whole system and thus one should always consider the inter-relational dimensions. This is quite easy how changing one range in one parameter changes many others, directly and indirectly, connected to it. Furthermore, this big amount of outputs directed us to choose what is suitable for our building financially, socially, and environmentally. Besides, going towards sustainable buildings can be a market-driven initiative. Owners and developers will go for green buildings if they understand how green buildings reduce the operation cost without increasing the construction cost.

Finally, yet importantly, I would like to recommend that BIM analysis should be conducted early on for any project in the conceptual stage. BIM programs can shed a lot of light on the sustainability parameters of any project, even if it is only just in the massing stage. The software offers the selection of ranges and no single values, precisely for flexibility during the early design stages. It is recommended to select wide ranges at the early phases of the project to allow for that flexibility and accommodate the frequent design decision changes. BIM technology will help designers adopt an integrated design approach from the very start of the project passing through all project's phases. Furthermore, it helps in creating a holistic system that is coordinated and smoothly functioning together in a complementary manner.

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CHAPTER ACTIVITIES 2018-2019



BOG members with RAL officers and leaders



BOG and members in the 2018-2019 CRC, Antalya



Miraco Carrier cooperation with ASHRAE Pyramids Chapter



Eng.Maged Fouad and Eng.Ahmed Abd ELGhami discussing steps of cooperation with Miraco Carrier



BOG members in Smoke management Seminar
22/10/2018



BOG members with RAL officers and leaders
in the chapter inauguration 17/12/2018



Students & BOG members



T.David Underwood, P.Eng with Darryl Boyce,
president-elect of ASHRAE



Prof. Tim Wentz lecturing in the end of 2018
seminar



relations between the Pyramids Chapter and
upcoming Jordanian Chapter



Prof. Ahmed A. Medhat lecturing in Influence of HVAC Systems on Gas Fire Suppression Systems



Engineers in the seminar of Influence of HVAC Systems on Gas Fire Suppression Systems



“High rise buildings” technical conference at Sharm El Sheikh



BOG members with Dr. Sherif El Haggan in FIDIC Contracts Dispute Adjunction Boards:



El Minya student branch



BOG members and RAL officers in gala dinner



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Minister of Electricity and
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