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EVALUATION OF EFFICIENCY OF THE PHYSIOLOGICAL COMFORT FOR WORKERS IN ANBAR GOVERNMENT

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ABSTRACT

The provinces of the physiological comfort of the people in Anbar province vary from one place to another according to the seasons and the nature of the response in humans as the age in response to the role in affected large human temperature more than the young, as well as different sex Females overnight with Feeling comfortable for males needs higher temperatures than males, as the study aims to demonstrate the impact of Anbar's climate in determining the regions' physiological comfort for workers in the governorate and to determine the most appropriate months and seasons for work efficiency through the use of anatomical criteria (Singer chart, Two Terejng panels, And the life plan of Olikai), and through the employment of climate elements (actual and theoretical solar radiation, maximum and minimum temperatures, wind speed, as well as maximum and minimum relative humidity) in order to arrive at an assessment of the climate of Anbar Governorate, and then determine the suitable places and sites for workers and their industrial facilities according to the months of the year The comfort of human physiological climate of the most important of The factors affecting the activity of workers and their production efficiency in the study area, therefore, the study was carried out to determine the levels of climate comfort for workers at night and day, and for each station selected for the study area and in each

month of the year, in order for the stakeholders and the official and responsible government agencies to be able to determine the places to establish activities. Disordered mankind, according to the requirements of each activity, is appropriate in order to reach the highest levels of physiological comfort for the two worlds, which results in the greatest economic benefit through increasing their activity and the efficiency of their work. The study found, by applying the criteria to seven stations selected for the study area for the period (1981-2019), and by relying on the method for analysis and quantitative application of some of the selected climate comfort standards, as the study showed that the best months for a comfortable daytime work are the months from November to February. As for the comfortable months at night for work are the months (March, April, October, November), while it turns out that the comfortable months in the day are (March, November), the comfortable months at night are (May, June, September). The study identified the months that need air cooling, as well as the months that need heating in order to reach the physiological comfort for the efficiency of work and workers.

Introduction

Since ancient times, climate scientists have been interested in studying the daily and annual changes of the climate element and its role in the comfort and health of the human being that directly affect its activities, activity and currency efficiency, as the climate affects the comfort and health of man through its elements, and that affects the levels of physiological comfort, as the climate affects Mental activity and the human ability to focus and intellectual competence that contribute to the productive capacity of a currency. Also, his muscular activity is affected by the elements of the climate, as the worker is at the peak of his activity when the internal body temperature is (37 ° C), and the elements of the climate have negative effects on the workers by infecting them with diseases. Each element has its own diseases and according to the severity and frequency of the element, and in general the climate affects the human being through his mental and muscular actions, as well as the increase in the costs of industrial, agricultural, or service production and for all human activities. The research stems from the hypothesis that: the spatial variation and seasonal change of climatic conditions have an impact on the health and production capacity of workers in Anbar Governorate. The research aims to apply some of the meteorological vital criteria to evaluate the climate of the study area from the health aspect, which in turn affects the efficiency of the productive workers and their activities, where the climatic regions will be determined for the physiological comfort of the workers while tracking their spatial and seasonal change. As the research will be applied to seven stations selected for the study area (Ramadi, Haditha, Anah, Age One, Al-Qaim, Al-Rutba, and Al-Nukhayb) for the period (1981-2019).

literature review

- **Climatic factors in Anbar Governorate that affect the efficiency of work and workers.**

The climate has a direct and indirect effect on workers and their production efficiency, through the possibility of their work. Some of them work outside the

buildings and are exposed to the elements of the climate is direct, as the effect here will be more severe than those who work inside the buildings, and here production and production costs will be affected according to the severity of the climate element that affects it, especially In climate extremes, where the high temperatures to which a person is exposed affect the physiological processes and are unable to achieve thermal balance with the external environment and thus harm his life, as the study was made to rely on data related to solar radiation (actual and theoretical brightness), and temperatures (Great and Low), the daily average of wind speed, as well as the relative humidity (maximum and minimum), and the maximum and minimum temperatures and the relative humidity (maximum and minimum) have been used because they give the actual effect on the human body and its feeling, so weather and climate play the largest role In determining the activity and ability of workers to produce and work, and here the climate has a direct effect on the health and activity of the human being, especially the involuntary physiological characteristics of the human body that enable it in the state of health From resistance to harsh climatic conditions (Salam , 2014) , and among the most important statistical criteria that dealt with the relationship between climatic conditions and human comfort in the study are (Singer diagram, Terejng criterion, and Olikiae climate chart) The standards were applied based on the existing data and according to the requirements of each standard.

1. Singer's diagram

The Singer scheme is one of the most important schemes that appeared in (1968) in the report prepared by the (Doxiades Consulting Foundation in Development Affairs for the City of Riyadh in the Kingdom of Saudi Arabia) (Oras, 2009), and it gives the best picture of the feeling of comfort and efficiency of work through the use of temperature and humidity, both of which have a great role in reflecting the impact of the climate on the comfort and health of man and the activity of workers. It was considered that heat and humidity are among the most influential elements of the climate. Through the chart, we can compare cities or climate stations. Where the scheme was used, depending on the maximum temperature element with the lowest relative humidity, to show the effect of the two elements of climate during the day, and the lowest temperatures with the greatest relative humidity at night, so that we can determine the comfortable and uncomfortable months for workers inside or outside the buildings, as well as working at night or during the day and under Direct sunlight or in the shade

- **Waller a fairway by day chart of the Singer is divided into three sections.**

By referring to Table (1) and Table (2) and applying them to Figure (25) as well as Table (3), it becomes clear to us through the use of maximum temperatures with minimum relative humidity to determine the ideal period for the maximum feeling of comfort as well as the efficiency of work in the day.

▪ **The ideal period for feeling the maximum daytime rest according to the Singer chart**

If the maximum rest is in the months of (March and November) for the stations (Ramadi, Haditha, Anah, Al-Qaim), and for the stations (Al-Rutba and Al-Nukhayb), it will be in October. The second of the best months to rest in them, in addition to the Age One station, in which the months of (April and November) were recorded. Thus, November is one of the best months, which appeared in all stations and was considered the most ideal month for a daytime rest for the period of study (1981-2019) for the selected stations of the region Study thus, these areas need to use industrial means and alternatives to increase the months of rest required for humans .

▪ **The ideal period for feeling efficient daytime work according to the Singer graph**

Through Figure (1) as well as Table (3), it appears that all the months of the winter season (December , January, and February) were found in the area of the maximum efficiency of work and in all the selected stations for the study area in addition to the month of March that appeared in my station (Ige Wan, wet) so is the winter curb separating the p stations with the month of March for the stations mentioned is the maximum duration of the work efficiency , thus showing that lower temperatures with high relative humidity lead to increased mental and muscular activity of man .

▪ **The annoying or uncomfortable daytime duration of the study period, according to the Singer graphic.**

It is the one that appeared outside the Singer Wali chart that extended for a long period of the months of the year. It appeared in all the selected stations for the study area. It extended from (April - October) except for the (Age One) station, and it extended from (March to May until October) The second), and in Al-Nukhayb station, it was from (the month of March to October). Thus, the annoying period for a person is (6-7) months during the year, so that the person does not feel comfortable at home or doing his work during the day as these months appeared outside the comfort zone specified by Singer. Here, we must find alternative solutions to modify the atmosphere and address these months through the use of cooling means in order to obtain comfort and the possibility of achieving efficiency in work for these months.

Table (1) The monthly and annual rates of the minimum relative humidity (%) in the stations of Anbar Governorate for the period (1981-2019)

the month	RAMADI	HADITHA	ANA	H1	AL QAIM	RUTBA	Al- Nukhaib
January 2	57	60	59	58	57	49	44

February	44	49	46	44	44	39	33
March	38	40	38	37	38	32	26
April	31	33	33	32	32	27	22
Mays	19	20	21	19	20	21	17
June	15	14	15	14	13	15	11
July	13	13	15	14	14	15	10
Father	14	13	16	15	15	14	10
September	17	16	18	16	17	17	12
1 October	22	21	24	24	23	23	21
2 October	42	36	39	38	37	36	31
Canon	54	56	57	55	55	44	39
the average	30.5	30.9	31.8	30.5	30.4	27.7	23

Source :Republic of Iraq, Iraqi General Authority for Meteorology and Seismic Monitoring, Climate Section, unpublished data

Table (2) The monthly and annual averages of the maximum temperature (° C) in the stations of Anbar Province for the period 1981-2019

seasons	winter			the spring			the summer			The autumn			the average
	Canon 1	Canon 2	February	March	April	Mays	June	July	Father	September	November 1	November 2	
RAMADI	18.7	15.2	18.1	24.9	29.2	35.3	38.2	42.3	42	38.6	32.4	25.2	30
HADITHA	16.1	13.9	16.4	21.3	30.4	35	39.8	42.8	42.6	38.5	31.7	22.4	30
ANA	16.4	14	16.2	21.1	28.6	34.6	39.5	42.7	42.4	38	31.5	21.9	28.8
H1	14.7	12.8	15.5	19.9	21.8	33.2	37.7	39.9	39.8	30.6	21.4	20.1	26.6
ALQAIM	15.7	12.9	16.4	21.6	28	33.9	38.5	41.2	40.9	36.6	30.6	22	28.2
RUTBA	15.5	13.6	15.7	19.8	26.4	31.9	36.4	39	39.1	36	29.6	21.1	27
Al-Nukhab	16.2	15.5	17.8	22.5	29.4	35.2	40.2	42.7	42.1	39.6	32.4	22.7	29.7

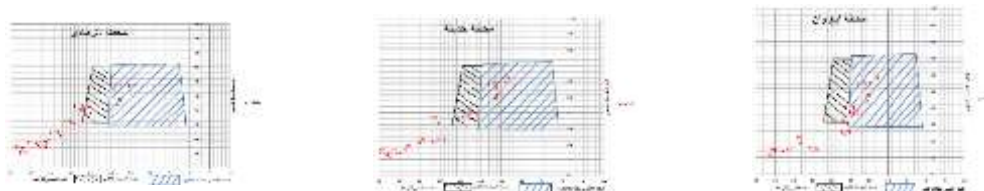
The total monthly sum of the seasons	327.3	584.0	849.8	622.9	
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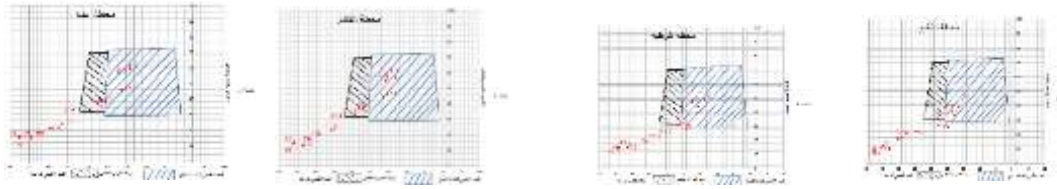
Source: - The Iraqi General Authority for Meteorology and Seismic Monitoring, Department of Climate, unpublished data, Table (3)

Months of ideal rest and maximum rest and bad months during confused stations of the study area for the period (1981-2019) according to the Singer scheme

The station Months		RAMAD I		HADIT HA		ANA		H1		RUTB A		RUTBA		Al-Nukh aib		
		Du rin g the da	nig ht	Du rin g the day	n ig ht	Du rin g the da y	n ig ht	Du rin g the da y	nig ht	Du rin g the da y	n ig ht	Du rin g the day	nig ht	Du rin g the day	n ig ht	
Months Co mfo rtable	Months of ma xi mu m res t	3, 4 11	5, 6 9	3, 4 11	6, 7 8, 9	3, 4 11	6, 7 8, 9	3, 4 11	6, 7, 8		3, 4 11	6, 7 8, 9	11	6, 7 8	11	— — — — —
	Months of ma xi mu m wo rk effi cie ncy	1, 2 12	3, 4 5, 10, 11	1, 2 12	4, 5, 10, 11	1, 2 12	4, 5 9, 10	1, 2 3, 12	4, 5 9, 10 11		1, 2 12	4, 5 10, 11	1, 2 12	4, 5, 10, 11	1, 2 12	
Months are Co mfo rtable	Hot sea son	5, 6, 7, 8, 9 10	— — —	, 5 6, 7 8, 9 10					, 5 6, 7 8, 9 10				, 5 6, 7 8, 9 10			
	Cold sea son	— — — —	,1 2 ,3 12, 4	— — —	, 5 6, 7 8, 9 10				— — —	, 5 6, 7 8, 9 10			— — —	, 5 6, 7 8, 9 10		

The source is the researcher's work based on (1, 2)
 Figure (1) To rest during the day according to the Singer chart of the stations chosen for the study area for the period (1981-2019)





Source: The researcher based on Table (1) and Table (2) and application in Excel (2010).

- The night's rest is according to the Singer chart, and it is divided into three parts. Here we use the lowest temperatures with the maximum relative humidity to determine the months of rest and the efficiency of work at night, because what matters to us is the actual effect of temperature and relative humidity on the human feeling, and in order to reach the most accurate values of the effect we used these degrees based on Table (5,4) and their application in the form of (2).

Table (4) Monthly and annual rates of maximum relative humidity (%) in Anbar governorate stations for the period (1981-2019)

the month	RAMADI	HADITHA	ANA	H1	AL QAIM	RUTBA	Al- Nukhaib
January 2	88	93	90	89	89	85	80
February	80	86	85	84	83	77	71
March	70	77	76	75	74	70	60
April	68	70	70	69	69	61	48
Mays	50	49	55	48	53	50	40
June	38	35	41	37	39	41	28
July	36	35	40	34	39	41	23
Father	36	36	43	35	42	41	24
September	46	46	45	44	44	43	30
October1	50	46	56	44	53	53	40
October2	69	65	73	64	70	68	53
Canon1	82	87	89	86	82	79	75
the average	59.4	60.4	63.6	59.1	61.4	58.9	47.6

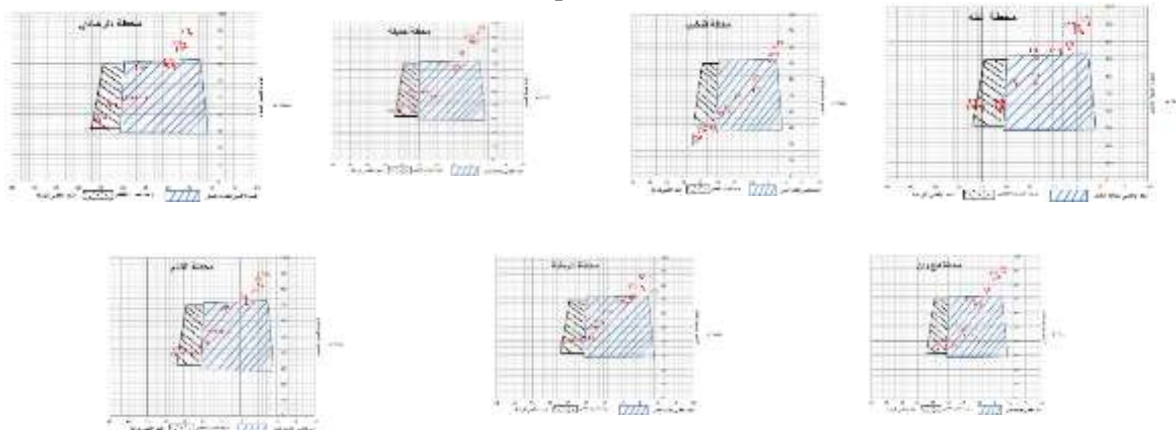
Source: Republic of Iraq, Iraqi General Authority for Meteorology and Seismic Monitoring, Climate Section, unpublished data

Table No. (5) Monthly, seasonal and annual averages of minimum temperatures (° C) in Anbar governorate stations for the period 1981-2019

seasons	winter			the spring			the summer			The autumn			
Months	Can on 1	Can on 2	February	March	April	Mays	June	July	Father	September	November 1	November 2	the average
RAMADI	6.1	4.7	5.9	10	14.8	20.1	23.9	26.2	25.2	21.5	17.1	10.3	15.5
HADITHA	5.1	2.8	4.5	7.6	14	19.1	22	26	25.7	21.4	16.4	9.2	14.5
ANA	4.5	2.4	3.6	6.5	13.3	17.6	21.2	24.9	24.8	20.3	13.7	8.3	13.4
H1	3.5	1.8	3.8	7.3	11.9	16.9	20.5	23.3	20.5	14.8	11.9	9.1	12.1
ALQAIM	4.1	2.6	5	8.3	13.3	18.3	22.8	25.4	24.6	20.5	15.5	8.1	14
RUTBA	4.3	4.2	3.6	7.2	12.5	16.7	21	23.4	23.5	20.1	15.1	8.4	13.2
Al-Nukhayb	4.5	3.1	4.7	9	14.7	19.8	23.6	25.3	24.8	21.8	16.6	9.3	14.8
Monthly total by seasons	84.8			278.9			498.6			309.4			

Source: - Republic of Iraq, General Authority for Meteorology and Seismic Monitoring, Climate Section, unpublished data

Figure (2) for resting during the night according to the Singer chart of the stations chosen for the study area for the period (1981-2019)



Source: The researcher based on Table (4) and Table (5) and application in Excel (2010)

- The ideal period for feeling the maximum night's rest, according to the Singer chart

Shows us through the table (3) and (Figure 2) , the n stations (modern, curse, which is based) the months that within the scheme to rest Night Singer (June, July, August, September) , either stations (Ige Wan, and wetlands), the Comfortable months at night (June, July, August) , the Ramadi station has appeared in the months (May , June , July, August , September) located within the resting area of the Singer scheme, and that Al-Nukhayb station did not show any comfortable month in the Singer chart. be

the month of May the best months for the comfort stations in the night that the H appeared at all stations except Nukhayib station.

▪ **The ideal period for feeling the efficiency of night work according to the Singer graph**

Figure (2) and Table (3) show that the efficiency of working at night varies between stations. Since the month of November () where he appeared in g j p selected stations of the study area except station (it), either months (April, May, October) has appeared in the chart of the Singer and all the stations so that not one of the best months comfortable for the night to work efficiency for the study area, as for the month (March), the plan for the stations (Ramadi, Al-Rutba, Al-Nukhayb) appeared in the plan for the stations (September). For each of the stations (Anah, Age One, and Al-Rutba) appeared in the plan. As for the month (February), it appeared In Al-Nukhayb station, thus these aforementioned months are among the best months for the maximum efficiency of work according to the Singer graphic.

▪ **The annoying or uncomfortable night time for the duration of the study, according to the Singer graph**

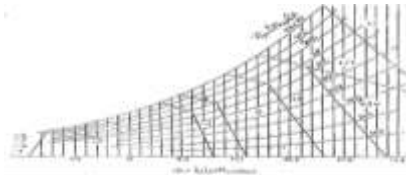
This period is considered to be the one in which a person feels disturbed due to the rise or fall of temperatures and according to the seasons, and this feeling differs between the selected stations, if it appears through Fig. (2) and Table (3) as the bad months differ from one station to another for reasons including elevation from the level the sea surface or the site in relation to water bodies and other reasons that were mentioned previously. For example, the months (December and January) appeared in all stations , as these two months were considered one of the worst cold months for the study area because they appeared outside the chart for Singer and all the stations, while the month (February) appeared in all stations except for the station (Al-Nukhayb), in the month of (March) The stations (Ramadi, Haditha, Anah, Age One, and Al-Qaim) appeared outside the Singer chart, as for the month of (November), the rest of the stations did not appear only with a station on Anah, and there are other bad months where temperatures rise at night and appeared outside the graph For Singer at Al-Nukhayb station, the months are (June, July, August, and September) .

2. Triggng Comfort Criterion (Terjun.GW)

Many climatologists and some of the architects have proposed many and varied measures to find out the extent to which man interacts with the surrounding climatic conditions, in order to determine his feeling of comfort or distress and discomfort, in addition to the Terejng classification, which was published in (1965) in the United States, which divided it into twenty climatic and physiological regions, which It is considered one of the important and modern human physiological classifications , due to its multiple applications in the geographical, tourism and even urban aspects (Salam , 2014) , and it is considered one of the useful criteria in assessing the climate and selecting sites suitable for the limits of physiological comfort, especially for the

elderly. any more suitable sites for hiking and recreation, as is this classification is important for the medical geography because it determines the geographical environment that helps the spread of diseases and the analysis of the relationship between climate conditions and help this standard in the engineering buildings by identifying the specifications of materials of construction as well as for determining air conditioning degrees required , where It contributes to knowing the limits of a person's comfort and ability to work, whether inside buildings , offices and factories, or outside For closed doors or when exposed to direct solar radiation. Aspects of the classification can be obtained if we apply them (Sabah, 2017).

The first aspect : - Determining the degree of a person’s comfort by the degree of comfort of the operative, without reference to any mathematical values or processes, if he prepared a standard plate with eleven climatic and physiological zones that show the person’s comfort and discomfort, which depends on the effective temperatures, and the temperature of the t Tabh dry, Wi - z the relative humidity, the form (3) and the table (6), and as shown in table (7) presumption rest of the night and day and the corresponding symbol.



**Figure (3) a comfort plate for Tringng (John, 1973)
Table (6) The Convenience Presumption. (JR, 1974)**

Sense of the people	code
Super cool	-6
Too cold	-5
so cold	-4
cool	-3
Tends to cooler	-2
Moderately cold	-1
comfortable	0
warm	1
Hot	+ 2 a
Discouraging hot calls for a feeling of anxiety	+ 2b
Extreme heat	+3

Through Table (6), Table (7) and Fig. (3), it is possible to obtain an indication of rest for a person day and night.

▪ **Areas of rest during the day**

Where the standard was applied by using the maximum temperature with the lowest relative humidity in order to reach the degrees that actually affect the human being and after applying it to the Terejng reference panel for comfort Figure (3) and it was shown through Table (8) by giving a comprehensive description of the stations of the study area and according to the mentioned standard, which is as shown Below.

Table (7) The combined rest at night and day and the symbol that corresponds to it Ter (jung, 1966)

the group	code	the group	code
M ₁	0/0	EH ₁	+ 3 / + b
M ₂	0 / -1	EH ₂	+ 3 / + 2A
M ₃	0 / -2	EH ₃	+ 3 / + 1
M ₄	0 / -3	EH ₄	+3/0
etc	etc	EH ₅	+ 3 / -1
C ₁	-1 / -1	etc	etc
C ₂	-1 / -2	S ₁	+ 2b / 2b
C ₃	-1 / -3	S ₂	+ 2b / 2A
etc	etc	S ₃	+ 2b / + 1
K ₁	-2 / -2	S ₄	+ 2b / 0
K ₂	-2 / -3	S ₅	+ 2b / -1
K ₃	-2 / -4	etc	etc
etc	etc	H ₁	+ 2a / + 2a
CD ₁	-3 / -3	H ₂	+ 2a / + 1
CD ₂	-3 / -4	H ₃	+ 2a / + 0
CD ₃	-3 / -4	H ₄	+ 2a / -1
etc	etc	H ₅	+ 2a / -2
VC ₁	-4 / -4	etc	etc
VC ₂	0/0	W ₁	+ 1 / + 1
etc	etc	W ₂	+1/0
EC ₁	-5 / -5	W ₃	+ 1 / -1
etc	etc	W ₄	+ 1 / -2

A. The months are rather cold and tends to be cold

The months that tend to be cold in all stations in the study area start from December to February, as the temperatures begin to gradually decrease in these months and they are very cold for all stations, with the exception of the Ramadi station, where the cold is moderate, while the Al-Rutba station begins with cold early on the other hand, as it starts in the month of (March) due to the reason for its height above sea level .And this coldness can be corrected by increasing the insulation of the clothes or by using heating methods in order to avoid the cold.

B. The hot months

Is clear from the table that the temperature sensation is hot start of the month (May until September), with the exception of wet station where a warm sensation in the month of May , while a sense of Balhar station A for wet starts from the month of June until the month of September during the day. If this long period of warm should be addressed to disrupt the business, especially businesses that are outside, but Ben Yeh, either that are inside the buildings can be addressed through the use of modern means of cooling, to avoid the risk of rising high temperatures, lack of exposure to sunlight dramatically, especially in the afternoon to prevent fatal heatstroke.

C. The comfortable months

The climate of the stations in the study area during the months (March, November) is characterized by a comfortable atmosphere, with the exception of the Al-Rutbah station. In the month of March, it recorded a moderate climate. In April, the Rutbah station recorded a comfortable atmosphere during the day.

D. The warm months

The month of April recorded a feeling of warmth for all stations except for the Al-Rutbah station, which recorded this feeling during the month of May. As for the month of October, it recorded the state of warmth and for all the stations selected for the study area, which requires an increase in wind speed with the addition of humidity. Relative to achieve a feeling of comfort.

- **Rest regions during the night**

Where the standard was applied using the lowest temperature, Table (4) with the maximum relative humidity, Table (5), to reach the degrees that actually affect the comfort and health of the human being and after applying it to the Terejng comfort panel, Figure (3) and it was shown through Table (9), which gave a comprehensive description for stations in the study area, according to the aforementioned standard, and they are as shown below.

A. The months that are rather cold and tilted are quite cold

It appears to us that the months are somewhat cold and moderately cold at night in all stations selected for the study area, starting from October to April, with the exception of the Ramadi station, if it appears in the schedule that this feeling starts from the month of November, in addition to the moderate cold months, the station (Ramadi) This feeling was recorded in the month of October, while the month of May recorded this feeling in all the selected stations for the study area.

B. Comfortable months

It is evident that the comfortable months at night extend from the month (June to September) and for all stations of the study area during the night.

- **Learring's composite comfort presumption**

To describe the nature of the climate during the day and at night, the two contemporaries are combined with one compound presumption, thus obtaining an accurate description of the climate through which we can determine the physiological comfort regions for each climatic station for the study area, as shown in Table (8).

1. Ramadi Station

The month of January is somewhat cold at night and during the day, and the month of February is somewhat cold at night and tends to be cold in the day. As for the month of April, it is warm in the day and somewhat cold at night. As for the month of May, it is hot during the day and moderately cold at night. The months (June, July, August, and September) climate is hot during the day and comfortable at night, while the month of October is warm in the day and moderately cold at night, in addition to the month of November, which is comfortable during the day and tends to be cold at night, as for December, it is moderately cold during the day and at night. For coldness at night.

2. HADITHA station

The winter months appear in it from December to February that it tends to be cold at night and during the day, while the month of March is comfortable in the day and tends to be cold at night, while the month of April is warm during the day and tends to be cold at night, but the month of May is hot in the day and moderately cold at night, and it turns out that the months (June, July, August) is hot in the day and comfortable at night, while September is hot in the day and comfortable at night, as for the month of October, it is warm in the day and tends to be cold at night, while the month of November is comfortable in the day and tends to be cold at night.

3. ANA

The months from December to February are characterized by being cold at night and during the day, while the month of March is comfortable during the day and tends to be cold at night, while the month of April is warm during the day and tends to be cold at night, but the month of May is hot in the day and moderately cold at night, and it turns out that the months (June, July, August) hot in the day and comfortable at night, while the month of September is hot during the day and comfortable at night, as for the month of October it is warm in the day and tends to be cold at night, while the month of November is comfortable in the day and tends to be cold at night.

4. H1

It turns out that the months from December to February tend to be cold at night and during the day, while the month of March is comfortable during the day and tends to be cold at night, while the month of April is warm during the day and tends to be cold at night, while the month of May is hot in the day and moderately cold at night, and it appears that the months (June , July, August) hot in the day and comfortable at night, while the month of September is hot during the day and comfortable at night, as for the month of October it is warm during the day and tends to be cold at night, while the month of November is comfortable in the day and tends to be cold at night.

AL QAIM

Table (8) shows the climatic description of the station that the months from December to February tend to be cold at night and during the day, while the month

of March is comfortable during the day and tends to be cold at night, while the month of April is warm during the day and tends to be cold at night, but the month of May is hot during the day Moderate cold at night, and it turns out that the months (June, July, August) are hot in the day and comfortable at night, while September is hot in the day and comfortable at night, as for the month of October it is warm in the day and tends to be cold at night, while the month of November is Comfortable in the day and cool at night .

5. RUTBA

It appears that the station in the months (December and January February) tends to be cold during the day and at night, while the month of March is moderately cold in the day and tends to be cold at night, and with regard to the month of April, it is warm during the day until it tends to be cold at night, and the month of May appears. During the day to moderately cold at night, while the months (June, July, August, and September) are hot in the day and comfortable at night, while October appears warm in the day to cool at night, in addition to the month of November, which is comfortable in the day is cooler at night.

6. Al- Nukhaib Station

We find that January tends to be cold during the day and at night, while February is moderate in the day and tends to be cold at night. As for the month of March, it is comfortable in the day but tilted with coldness at night, while the month of April is warm during the day and tends to be cold at night, but the month of May is hot in The day is moderate at night, as for the months (from June until September) it is hot during the day and comfortable at night, while October is warm in the day and tends to be cold at night, while November appears comfortable during the day and tends to be cold at night, and at the end the month of January appears. The first is moderately cold during the day to cool at night.

Table (8) The vehicle comfort contraction for trending (for day + night)

Stations	RAMADI			HADITHA			ANA			H1		
	Daytime context	Presumpti	Group icon	Daytime context symbol	Presumpti	Group icon	Daytime context	Presumpti	Group icon	Daytime context	Presumpti	Group icon
Canon 2	-2	-2	K1	-2	-2	K1	-2	-2	K1	-2	-2	K1

February	-1	-2	C2	-2	-2	K1	-2	-2	K1	-2	-2	K1
March	0	-2	M3	0	-2	M3	0	-2	M3	0	-2	M3
April	+1	-2	W4	+1	-2	W4	+1	-2	W4	+1	-2	W4
Mays	+ 2a	-1	H4	+ 2a	-1	H4	+ 2a	-1	H4	+ 2a	-1	H4
June	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
July	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
Father	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
September	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
November 1	+1	-1	W3	+1	-2	W4	+1	-2	W4	+1	-2	W4
November 2	0	-2	M3	0	-2	M3	0	-2	M3	0	-2	M3
Canon 1	-1	-2	K1	-2	-2	K1	-2	-2	K1	-2	-2	K1

Source: The researcher depends on the results of implementation, Table (7)

Stations	BasedAL QAIM			RUTBA			Al- Nukhaib		
	the month	Daytime context symbol	Presumption of the night symbol	Group icon	Daytime context symbol	Presumption of the night symbol	Group icon	Daytime context symbol	Presumption of the night symbol
Canon 2	-2	-2	K1	-2	-2	K1	-2	-2	K1
February	-2	-2	K1	-2	-2	K1	-1	-2	C2
March	0	-2	M3	-1	-2	C2	0	-2	M3
April	+1	-2	W4	0	-2	M3	+1	-2	W4
Mays	+ 2a	-1	H4	+1	-1	W3	+ 2a	-1	H4
June	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
July	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
Father	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
September	+ 2a	0	H3	+ 2a	0	H3	+ 2a	0	H3
November 1	+1	-2	W4	+1	-2	W4	+1	-2	W4

November	0	-2	M3	0	-2	M3	0	-2	M3
Canon 1	-2	-2	K1	-2	-2	K1	-1	-2	C2

Supplement to Table (8) the presumption of the vehicle's comfort (for day + night)

3. Olgay Living Environmental Climate Criterion

This scale is considered one of the best measures used to measure the comfort of a person entering and leaving the building in the shade or under the rays of the sun, and this criterion appeared at the hands of the scientist Olgay) Year1963 , As the standard appears in the form of a graphic chart and is called (the bioclimatic calendar map), where the vertical coordinate is the temperatures of the dry heat, while the horizontal coordinate is the relative humidity of the air, while the middle of the chart is the comfort zone, which ranges from temperature (27.5-21)M, and relative humidity between(77-18) (shafek , 2016) %, where the influencing temperature within this area secures the thermal balance of the human body in the shade without the need for sweating or shivering when performing its activities naturally, and when the influencing temperature falls above the comfort zone, achieving comfort needs other climatic requirements Such as moving the air or increasing the percentage of humidity in the atmosphere in addition to deception, and when the influencing temperature falls below the comfort zone, radiation is required to achieve comfort, either by exposure to solar radiation in outdoor spaces or by controlling the temperature of surrounding surfaces, and on this basis it was considered the degree of limitation. Minimum comfort zone ((21 M, and it separates two possibilities, so everything that falls above this line with increasing temperatures needs complete deception, and everything that falls below this line, i.e., by reducing the temperature, needs the presence of solar radiation to reduce the feeling of cold (Narrator, 2017). And we can divide the climate comfort according to the Olgay chart into two parts:

▪ **Day rest**

As it is calculated through the Olgay chart depending on the maximum temperatures in the vertical axis with the average minimum relative humidity in the horizontal axis, then the months are then classified according to the seasons comfortable or uncomfortable, and then treatments are done in order to correct the annoying months, through Using industrial means for heating or adding relative humidity to the air, and wind speed can be increased by industrial devices, and in order to reach an accurate description of the climatic condition, the months of the year were divided into three theoretical groups, each group separately and to ensure that the results do not overlap, through Figure (5) For Olgay's daytime lifestyle chart, it is clear:

1 -Winter months group

It appears through the aforementioned figure, depending on the data of Table (1) and Table (2), and for all stations of the study area chosen for the winter season, all points are located outside the comfort zone and at the bottom of the scheme and the dimensions of each month differ according to the maximum temperatures and the minimum relative humidity, and that all the stations need to correct the atmosphere by increasing the thermal calories , which is the source of solar radiation or may be

any means brother irrigation means of heating, and the range of their need from December through February is between (12.6-37.8) thermal / hour calories and all stations or through the use of Industrial heating means inside homes, and the wind speed must be reduced to less than (0.5 m / s), with a decrease in relative humidity below (40%), to avoid infection with diseases in these months and so that workers can do their work completely inside or outside the building.

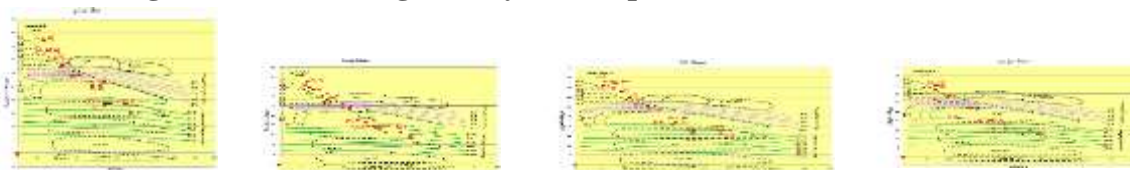
2 -Set of the months of the equinoxes (spring and autumn)

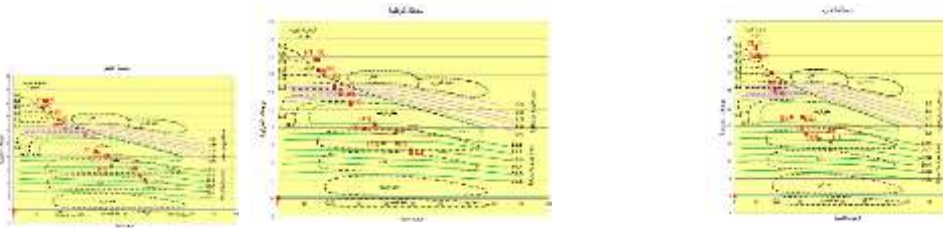
After analyzing the life plan of the Oulgay, we find that the months of the spring equinox (March, April, May) differ from the study stations, as we find that the month of March and all stations are inside the rest area during the day, while the month of April is inside the daytime resting point in the stations (Age One , Al Rutba) As for the rest of the stations, it appeared in the equinox zone, while the month of May appeared outside the uncomfortable area on the upper left side of the scheme, which needs to add moisture by (3.6 g / km) and winds at a speed of (3.5 m / s) and fans and coolers can be used up to Aastt Aa workers feel comfortable in this chapter. As for the autumn season (September, October, and November), if the month of September appears as one of the hot months to fall on the upper left side, which needs to increase the wind speed with humidity by (4.3 g / km), while the month of October has also appeared outside the region. comfort and which needs to be by air humidity (3.6 g / km) and wind speed (3.5 m / s), whereas the back of the month of November within the comfort zone at all stations except station (Ige and, damn wet) p s d back down from an area Resting in an area tends to be moderately cold. Thus, November is a comfortable month for people inside and outside homes during the day, with the addition of some calories.

3-Summer months group

All summer months appear on the upper left side of the chart and that summer is characterized by a very annoying heat, and as these months show by collecting the stations of the selected study area in Figure (5), the reason for this rise is due to the amount of high solar radiation due to the verticality of the sun, which is due to the actual length of day that led to high temperatures and low relative humidity, it will delight requires correcting the atmosphere in the summer using cooling devices modern (Split or air) for the purpose of cooling, and also requires reducing the isolation of clothing and not go out the day under the sun 's rays directly because he may become human disease summer and it's a blow to the sun , and that the region was exposed to heat waves in this chapter and Arah toxins due to the high degree of Thermal.

Figure (5) the general life climate plan for the selected stations in Anbar governorate during the day for the period (1981-2019)





Research source based on Table (1) and (2).

- **Night rest**

Through Figure (6) and after applying the minimum temperature values with the maximum relative humidity values depending on Table (4) and (5) and after applying them to the Olgay life chart for the selected stations for the study area, the nighttime rest becomes clear to us, which means the level at which the rest reaches Acceptable limits during some months, which are known as the ideal months. What deviations from this level are corrected using natural or artificial means, are divided into three parts, as in the daytime rest.

1- Winter months

Figure (5) shows that all winter months are outside the resting area at the bottom of the plan and on the right side and for all the stations selected for the study area, and that these months (December, January, February) need heating, especially at night because of the cold weather and the like. Of a bad impact on the health of workers, especially those whose work requires exposure to climatic conditions directly, so it requires that they wear clothes with high insulation capacity because heating is not possible in these harsh climatic conditions, and because of the difficulty of correcting the atmosphere outside the buildings, but inside the buildings, special devices and means must be used. To keep warm to avoid getting cold .

2 -The equinoxes group (spring and autumn)

It can be seen from Figure (5) that all the spring months are outside the Al-Rahiya area and vary between the months and the stations, if the month (March) appears at the bottom of the chart and in the cold region and for all stations, which can be addressed by increasing the calories using industrial means with wearing clothes with insulation. Good calories so that a person avoids getting a cold bite. As for the month of April, calories of (25.2) calories per hour can be added to all stations. As for the month of Nice, it appeared in the moderate cold region, which can correct the atmosphere by adding calories or clothes with good insulation , the most famous autumn month of September it shows is located within the dotted comfort ideal night scheme Aogaa, in stations (gray, modern, Nukhayib) , either the focus of data (Ige and , curse, based, wet)) , it falls to the bottom of the perfect comfort zone, so Tana c to the simple addition of calories clothes have to be alone enough or work inside the buildings to achieve comfort, in while the first month of October needs estimated

prices Hrar (12.6) calories / hour for all stations. In addition to the month of November, which is located within the cold region, which is below the chart, and for all stations in the study area, and that this month needs heating by adding calories, which amount to (50.4) calories per hour, or by industrial means with increased insulation for clothes.

3 -The most famous summer season.

All the months of this season appear in the ideal comfort zone and in all stations, except for the station (Age One), the monthly art (June, August) is at the bottom of the comfort zone ideal in the cold temperate zone that needs a little bit of calories or increased insulation for clothes to achieve the ideal comfort for workers.

Figure (6) General life climate plan for the selected stations in Anbar Governorate at night for the period (1981-2019)

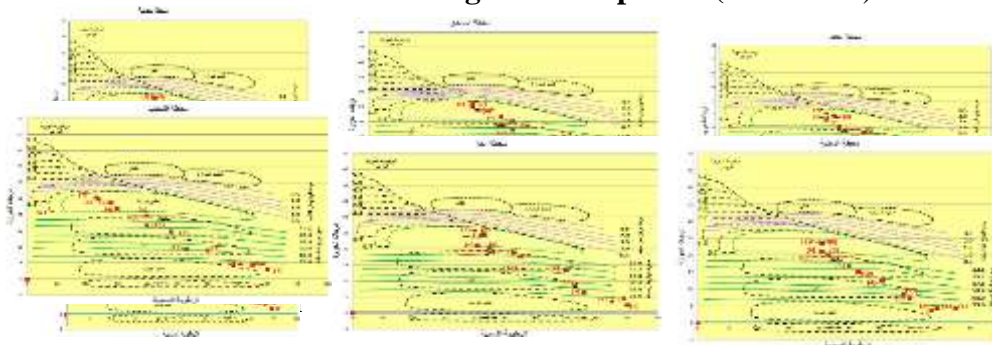


Table (8), the maximum rest and work efficiency months in Anbar, according to the Oligay standard and according to the selected stations for the period (1981-2019).

Stations	Al- Nukhaib		RUTBA		AL QAIM		H1		ANA		HADIT HA		RAMADI	
	Dur in g th e da y	nigh t	Dur in g th e da y	nigh t	Dur in g th e da y	nigh t	Dur in g th e da y	nigh t	Dur in g th e da y	nigh t	Dur in g th e da y	nigh t	Dur in g th e da y	nigh t
Comf ortab le mont hs	3, 4,	6, 7, 8, 9	3, 4, 11	6, 7, 8, 9	3, 4, 11	6, 7, 8	3, 4, 11	6, 7, 8	3, 4, 11	6, 7, 8	4, 11	6, 7, 8	3, 4, 11	6, 7, 8, 9
The unco	11	1, 2, 3, 4, 5 10, 11, 12	2, 1, 5,	1, 2, 3, 4, 5 10, 11, 12	2, 1, 5,	1, 2, 3, 4, 5, 9,	2, 1, 5,	1, 2, 3, 4, 5, 9,	2, 1, 5,	1, 2, 3,	2, 1, 5,	1, 2, 3,	2, 1, 5,	1, 2, 3, 4, 5 10, 11, 12

comfortable months			6, 7, 8, 9, 10, 12		6, 7, 8, 9, 10, 12	10, 11, 12	6, 7, 8, 9, 12	10, 11, 12	3, 4, 5, 6, 7, 8, 9, 10, 12	4, 5, 9, 10, 11, 12	6, 7, 8, 9, 10, 12	4, 5, 9, 10, 11, 12	3, 4, 5, 6, 7, 8, 9, 10, 12	
Months that need heating	2, 1, 5, 6, 7, 8, 9, 10, 12	2,1, 3, 4, 5, 10, 11, 12	1, 2, 12	2,1, 3, 4, 5, 10, 11, 12	1, 2, 12	2,1, 3, 4, 5, 9, 10, 11, 12	1, 2, 12	2,1, 3, 4, 5, 9, 10, 11, 12	1, 2, 12	2,1, 3, 4, 5, 9, 10, 11, 12	1, 2, 3, 4, 5, 9, 10, 11, 12	2,1, 3, 4, 5, 9, 10, 11, 12	1, 2, 12	2,1, 3, 4, 5, 10, 11, 12
Months that need cooling	1, 2, 12	_____	6, 5, 7, 8, 9, 10	_____	6, 5, 7, 8, 9, 10	_____	6, 5, 7, 8, 9, 10	_____	6, 5, 7, 8, 9, 10	_____	6, 5, 7, 8, 9, 10	_____	6, 5, 7, 8, 9, 10	_____

Source: The researcher based on Figure (5, 6)

Conclusion

Results

The results of the statistical and application criteria for the improvement of the climate of Anbar Governorate and the cycle of their production efficiency and health came through the use of the Singer chart and Tering standards using the comfort graphic panel, and as the life chart was used for Ulikai, where the results came as follows:

1. The results of the Singer chart came, as the months of rest during the day and at night were determined, as the months (March, November) represent the best months for rest during the day, and the comfortable months at night (June, July, August, September) and according to the selected stations for the study area.
2. While the chart showed the maximum work efficiency during the day, which is represented by the months (December, January, February), in addition to the night, which showed that the work efficiency is represented by the months (April, May, October, November). While the chart showed that the uncomfortable hot months extend from the month (June to September), as its role appears in the daylight hours as the heat becomes annoying and may lead to disease, especially outside the buildings, while the uncomfortable (cold) months are the months (December, December). The second, February, and until the end of March), when the temperatures are lower at night, thus helping to infect diseases as a result of exposure to them.
3. The results of the Terejng criterion and Olgay's life plan were identical to the Singer chart if the comfortable months for daytime work were recorded (March,

April, November), while the months from May until October were uncomfortable for daytime work due to the high temperatures that Lead to climate disease.

4. The study shows the uncomfortable months of working at night for the cold season, as they were close to the criteria and extend from the month (October - April), when the worker needs warm workplaces, especially those who work at night, which increases the likelihood of contracting diseases.

Recommendations

1. Developing engineering designs for the work site so that they are appropriate from all sides, taking into account the climate aspect in terms of direction to the buildings and the type of materials used in construction and all that is needed in order to obtain comfort, and it is necessary to ventilate the places crowded with workers and make a space between them so that diseases that affect them not spread on their efficiency, and disposing of waste in a healthy way.

2. The study recommends taking advantage of times when the climate is comfortable to complete activities that require great muscular effort, especially those outside the buildings, taking into account the physical and age differences of workers and even gender. If the noon hours are a time of rest for workers, especially outside or inside the buildings and in which no cooling means are available. In summer, these hours are compensated during the early morning.

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