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(Barrel Vaults)   .

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(Sol – air temperature)   –

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.(Thermal   conductivity)
(Solar Intensity)

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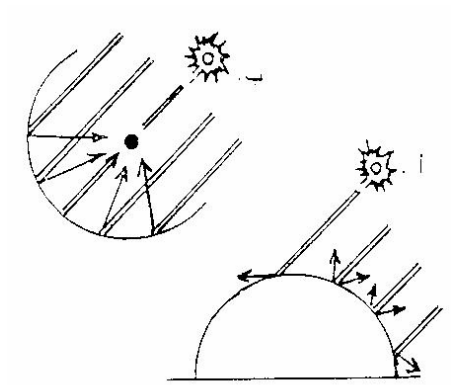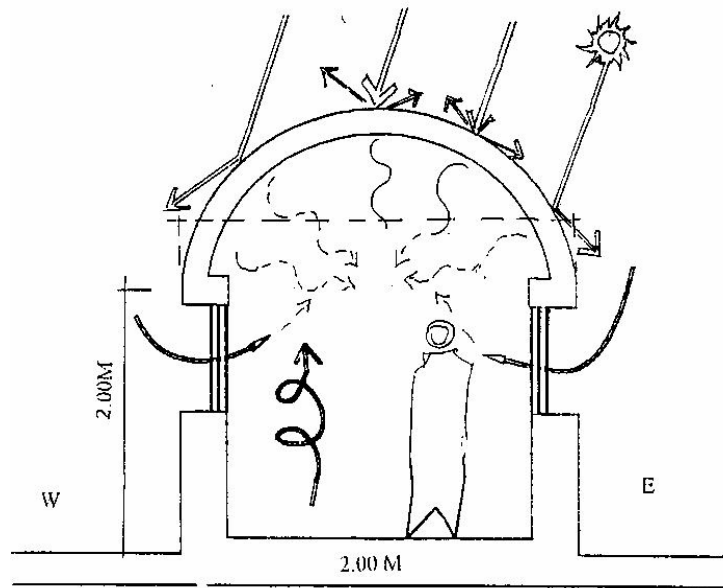*(Barrel Vault)*   *1-1*

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(Barrel Vault)

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(Longwave Radiation)

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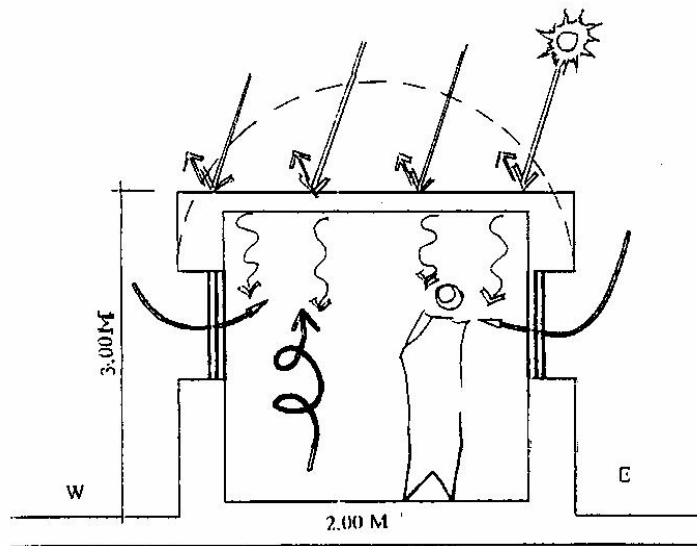
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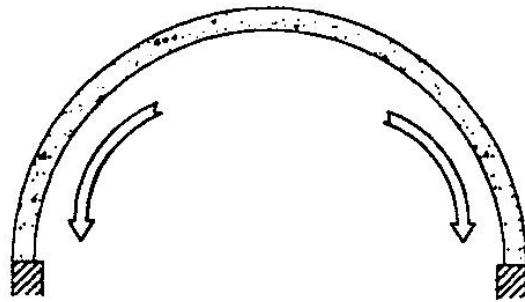
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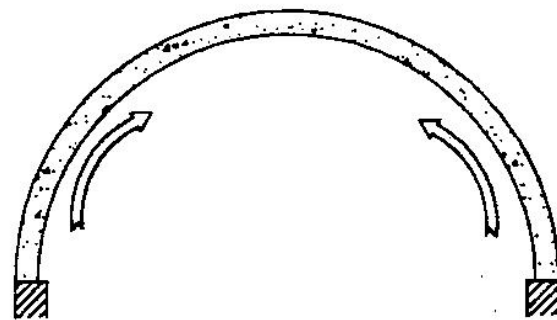
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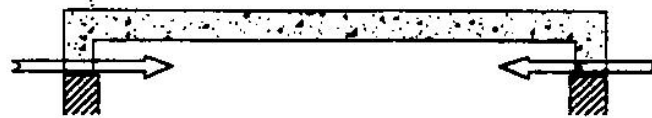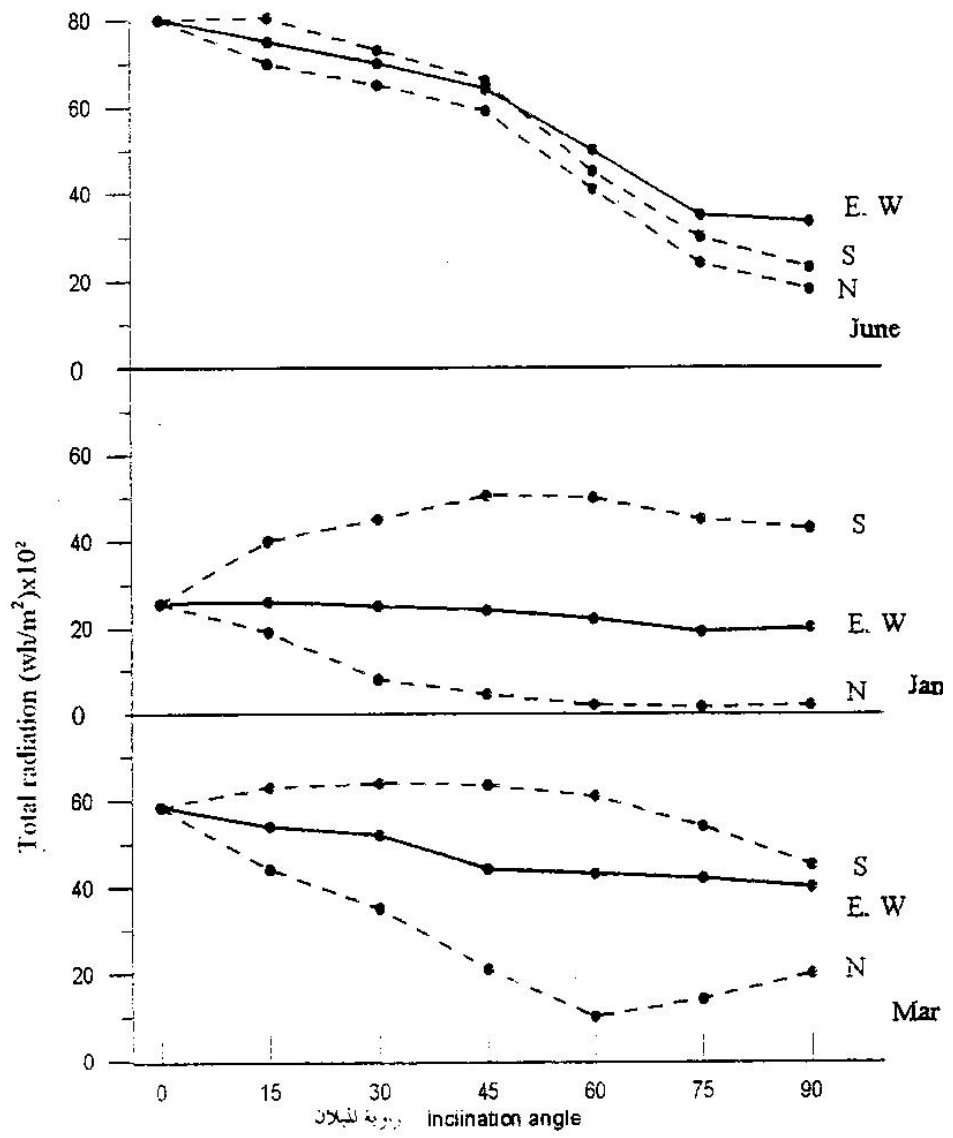(2   )   .   2   2   10

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(AL Riahi, M. 1985)

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(Sol-air   temperatures) (   )   2-3

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(–   )   (3   ) (2

[5] (ASHRAE Guide 1981 Chpt – 28)   (Sol-air temperature)

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(AL Riahi, M. 1985) (/   .   )   (1)

°0	°30	°45	°65	°80	°30	°45	°65	°80	°30	°45	°65	°80	
3.10	4.10	5.30	5.10	2.90	2.80	2.80	2.50	2.50	0.90	0.80	0.70	0.60	
4.50	5.70	6.50	5.70	4.90	4.20	4.00	3.40	3.00	2.00	1.70	1.40	1.00	فبراير
7.00	6.80	6.80	6.00	5.10	5.70	5.10	4.30	3.60	3.90	2.60	1.80	1.30	مارس
8.10	7.10	6.60	5.60	4.40	6.20	5.50	4.50	3.80	4.50	3.60	2.00	1.50	ابريل
8.40	7.30	6.60	5.30	3.60	6.60	5.80	4.80	4.10	5.70	4.70	3.00	1.60	مايو
8.50	7.40	6.50	4.80	3.20	7.10	6.20	5.20	4.20	6.80	5.70	3.90	1.70	يونيو
9.50	7.50	6.60	5.30	3.60	6.60	5.80	4.80	4.10	5.70	4.70	3.00	1.60	يوليو
8.00	7.10	6.60	5.60	4.40	6.20	5.50	4.50	3.80	4.50	3.60	2.00	1.50	أغسطس
7.20	6.80	6.70	6.00	5.10	5.70	5.10	4.30	3.60	5.90	2.60	0.90	1.30	سبتمبر
5.00	5.70	6.00	5.10	5.00	4.20	4.00	3.40	3.00	2.40	1.70	0.80	1.90	أكتوبر
4.00	4.70	5.20	5.10	4.90	2.80	2.80	2.50	2.50	0.90	0.80	0.70	080	نوفمبر
2.80	3.60	4.60	4.80	4.90	2.50	2.00	1.90	1.90	0.40	0.20	0.50	0.60	ديسمبر

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● (Solar Intensity)

● .(Ambient Air Temperature)

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teo = tao + Rso (alt - εIL) ᵒC   **(ASHRAE)**

teo: Sol – air temperature ᵒC   :

teo: outdoor air temperature ᵒC   .   −

.   −

A: absorption coefficient of the   .   −
     outer surface of the construction.

It: intensity of solar radiation. ^{2} /   −

ε: emissivity of surface of the outer   −
     surface to longwave radiation.

     0.9 .

IL: Longwave radiation from a   −
     black surface at outdoor air
     temperature.   w/m

     113.5 .

Rso: external surface resistance.   −

     0.045

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(Resistivity)

.(Emissivity)   (Absorptivity)

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(Thermal conductivity)   (

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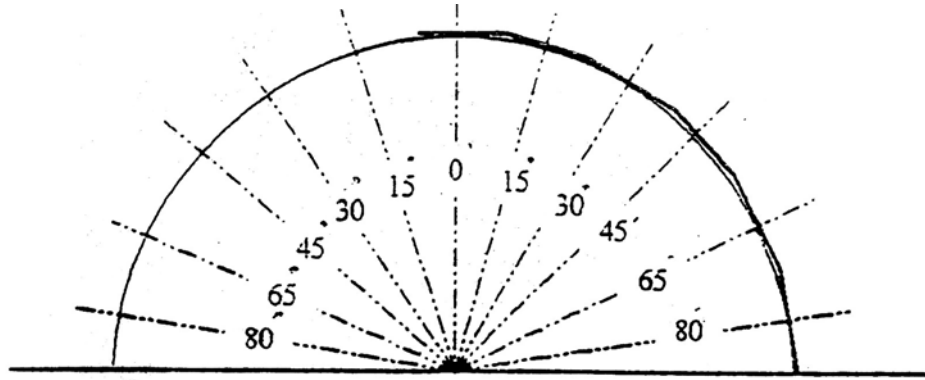.[1]   20 15

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$(Q/A) = U (teo – ti)$ (Szokolay, 1980)

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Q/A: Daily mean heat flow. Wh/m^2 -

U: Over all thermal   (U value) -
Conductance coefficient. W/m^{o}C   .

$U = 3$

$U = 1.17$

teo: ^{o}C   -

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ti: ^{o}C   -

^{o}C 25

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Wh/m^2 142.8 = 3(72.6-25)   *

$$-\qquad 3(61.3-25) = 108.9 \ Wh/m^2$$

$$-\qquad U = 1.17 \qquad 1.17(61.3-25) = 42.5 \ Wh/m^2$$

(3)

) $U = 3w/m^oC$

(%24 .

^oC 1.17 w/m

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(2) –

C^o		wh/m^2			
52	72.6	410	950	80	0
54.7	72.6	480	950	65	0
58.2	72.6	580	950	45	0
61	72.6	660	950	30	0
66	72.6	800	950	15	0
62.6	72.6	950	950	0	0
66	72.6	800	950	15	0

61	72.6	660	950	30	0
58.2	72.6	580	950	45	0
54.7	72.6	480	950	65	0
52	72.6	410	950	80	0
61.3	72.6	527	950		

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(8   )
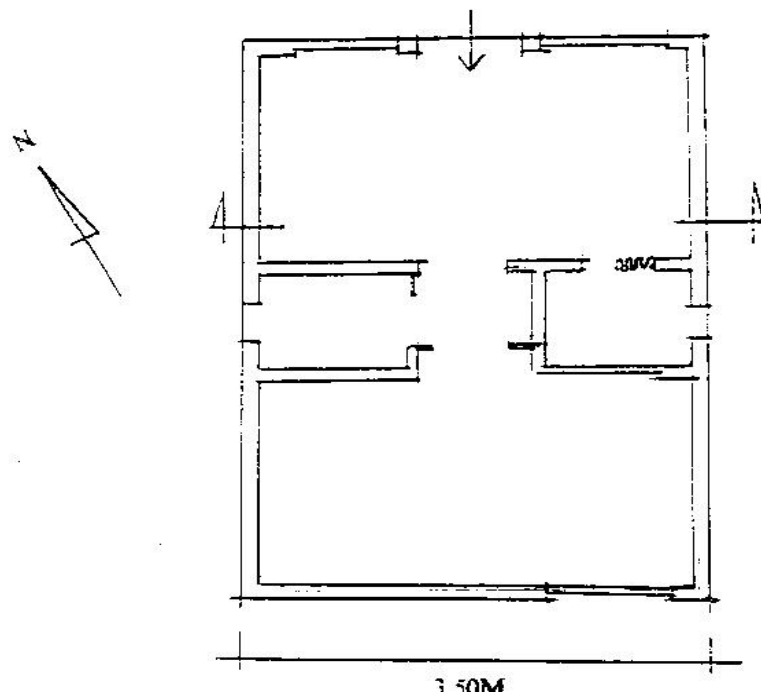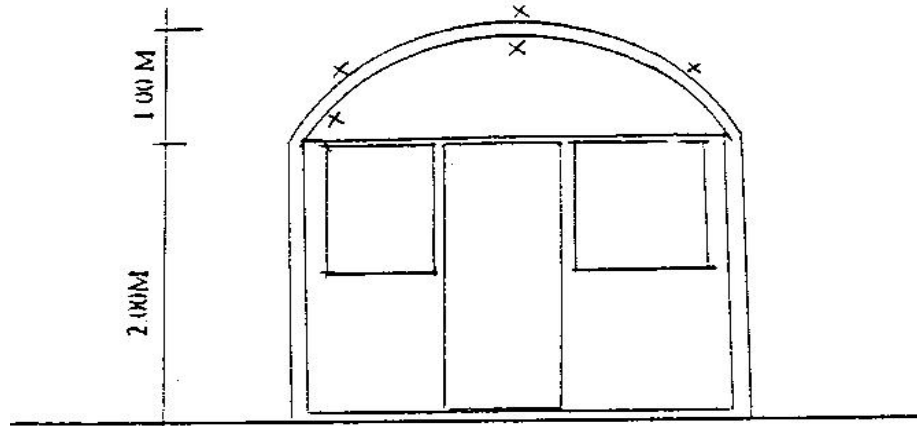
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"Evaporative Cooling"

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[4]

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Barrel Vault Roofs for Passive Cooling in Low Rise Buildings

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Applied Sciences University, Amman - Jordan

ABSTRACT. Barrel vault roofs reject most of the solar radiation that impinges on their surface due to their shape. In hot countries, excessive heat inside buildings, caused by flat roofs, can be reduced if altered to the vaulted shape. This paper studies the thermal performance of the barrel vault roof according to its solar rejecting capability compared to that of the flat roof, under the prevailing climatic conditions in Iraq. Sol-air temperature method is used for evaluation, which shows the great cooling effect of the barrel vault roof. External and internal surface temperatures are recorded for a barrel vaulted roof of a house, built with one floor in a low-income group of housing. The recorded temperatures are close to those estimated in this paper. Conclusions and recommendations are drawn from the investigation for energy efficient buildings.