Energy Efficiency Training and Information Project

Commercial Buildings

Tahbilk
VIC

this project entitled “Energy E f ciency Training and

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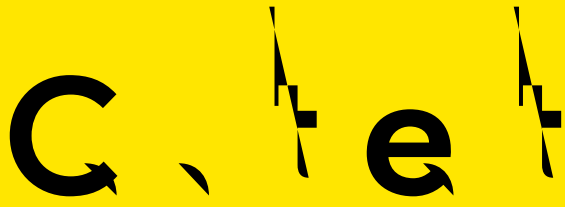


1 .

reduce fnal energy consumption for space heating

2. Re a , S a da d , a d de e

- National Construction Code of Australia 2019 Volume One.
- ANSI/ASHRAE 62.1-2019 Ventilation

3. I t d c

for methodology replication and f ndings expansion to

e f ciency in such buildings.

building's construction features, including the e f ciency

etc.). The e f ciency of the HVAC&R system (Coe f cient of Performance (COP) and Seasonal Energy E f ciency

Additionally, two types of speci f c conditions that have a signi f cant impact on the energy performance must

ventilation patterns, use of arti f cial lighting, etc.)

4. Tahbilk at a glance

In Köppen's climate classification, Tahbilk is categorised

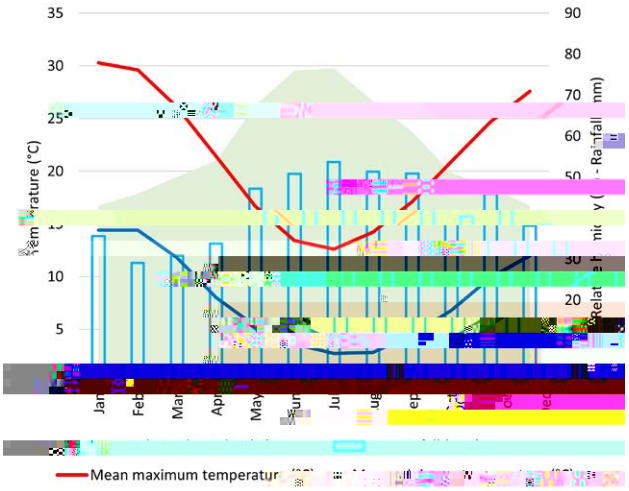


Figure 1. Climatic data of Tahbilk [6].

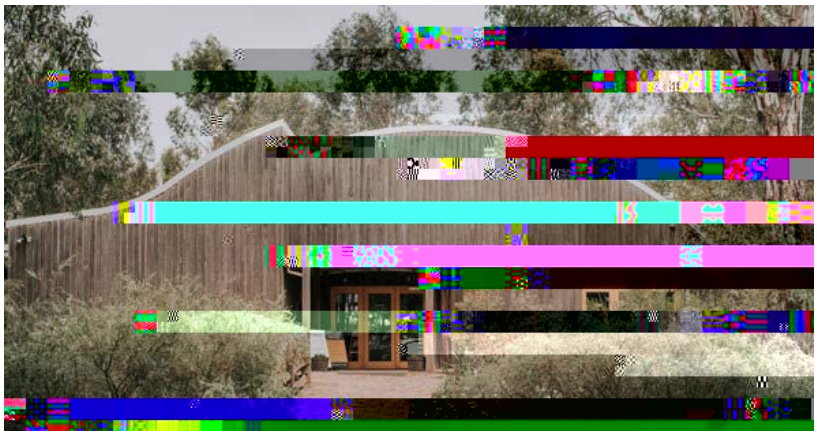


Figure 2. Southern view of Tahbilk restaurant.

The classification of Tahbilk restaurant according to

The total gross floor area is 323.0 m².

cost of buildings is to improve energy efficiency.

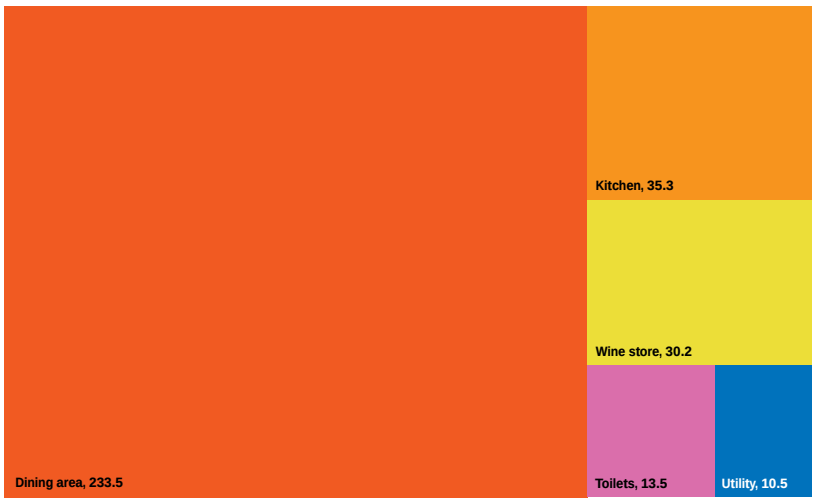


Figure 3. Gross floor divided area of case study building.

a solar reflectance of 0.277. Also, using the average

4.2.6. Ventilation and infiltration

The supplied fresh air flow rates and the infiltration rates information provided by TWCM, the coefficient of performance (COP) and energy efficiency ratio (EER)

Table 7. Temperature setpoints, lighting and personal heat gain.

	Building	Value	Unit	Ref.	Section and page

Table 8. Ventilation and infiltration.

	HVAC&R system	Value	Unit	Ref.	Section and page
Fresh air					
Infiltration					

Table 9. Thermal comfort parameters.

Factor	Value	Unit	Ref.	Section and page

with some modifications due to provided documents

Table 10. Occupancy, lighting and appliances schedules.

Time	Occupancy	Lighting	Appliances and equipment	Air-conditioning

Table 11. Scenarios for reduced energy consumption for lighting.

Base-case scenario	
Scenario 1	The lighting power density is reduced with the use of e f cient light
Scenario 2	

for the improvement of the natural and arti f cial

1.

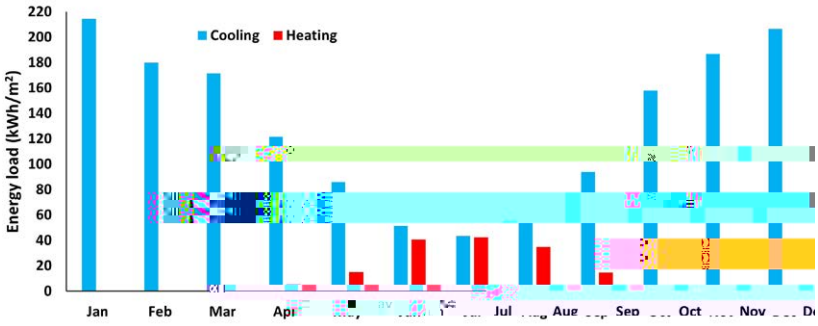
2.

3.

heating loads from arti f cial lighting, complying

existing natural and arti f cial lighting conditions. Using

Level	Average Daylight Factor (%)	Uniformity	sDA (%)


Cooling
Heating
Energy load (kWh/m²)
220
200
180
160
140
120
100
80
60
40
20
0
Jan
Feb
Mar
Jul
Aug
Sep
Oct
Nov

is the gains by infltration;

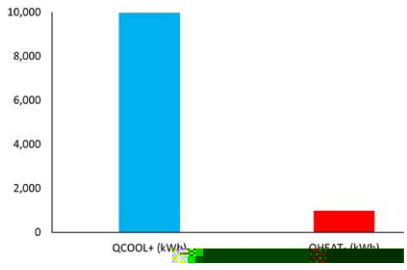


Figure 8. Whole building energy gain for heating and cooling load – heating season (May-September).

Figure 10. Whole building energy gain for heating and cooling load – cooling season (October-April).

and the influence of each

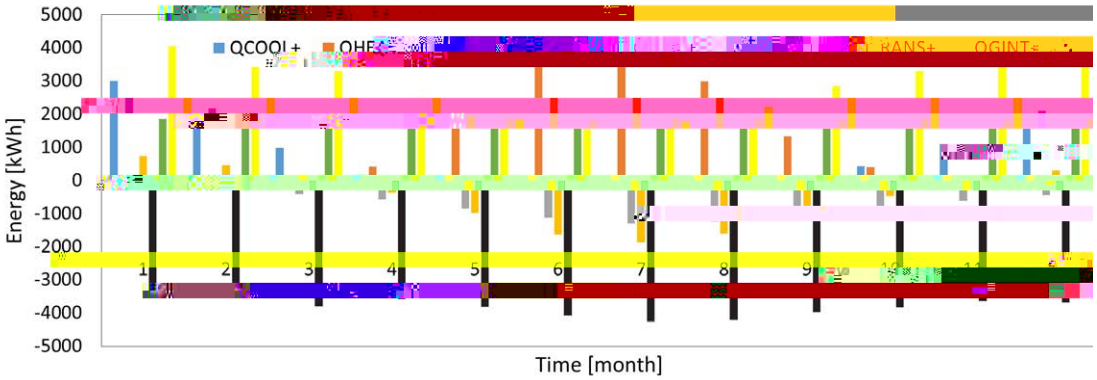


Table 13. Retrofit cases.

Cases	Description

The investigated retrofit

retrofitting steps. Table 14 shows the influence of different retrofitting cases on heating and cooling loads.

retrofit scenarios on electricity consumption in the case

retrofitting impact is presented in Figures 12-14.

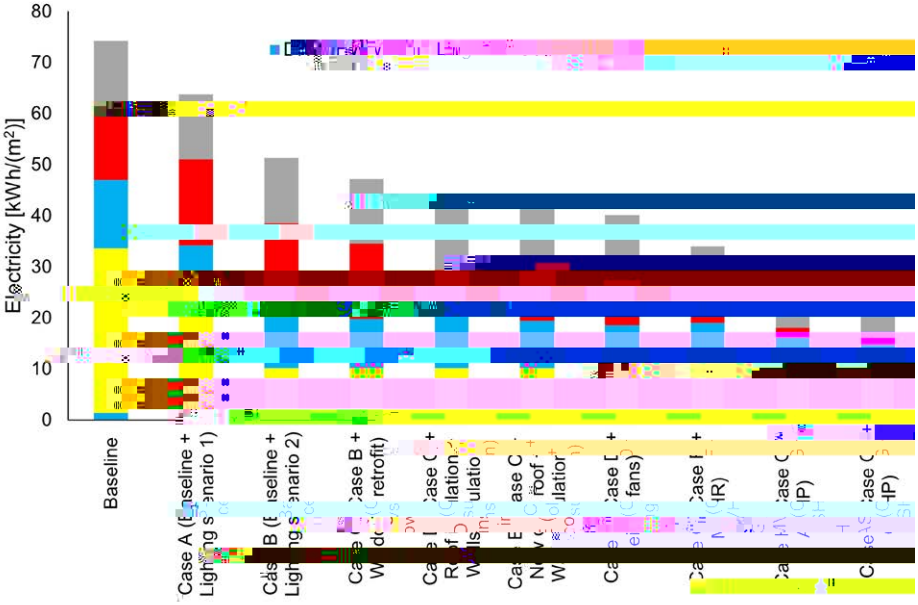


Figure 12. Site energy of the retrofit scenarios.

scenarios that would lead to a specifc radiative forcing

address primarily cooling energy e f ciency. →

Table 16. Current and future energy demand of the case study restaurant based on CSIRO weather database.

Location	Period	Site energy						Site energy variation (%)		
		DHW	Heating	Cooling	Lighting	Appliances	Total electricity	Heating	Cooling	Total electricity
Adelaide	Present	1.4	103.5	69.8	32.2	12.7	219.6	-	-	-
	2030	1.4	83.6	83.9	32.2	12.7	213.8	-19.2	20.2	-2.6
Brisbane	Present	1.4	12.5	74.0	32.2	12.7	132.8	-	-	-
	2030	1.4	8.7	92.7	32.2	12.7	147.7	-30.4	25.3	11.2
Canberra	Present	1.4	177.3	42.4	32.2	12.7	266.0	-	-	-
	2030	1.4	153.2	53.2	32.2	12.7	252.7	-13.6	25.5	-5.0
Darwin	Present	1.4	0.3	332.0	32.2	12.7	378.6	-	-	-
	2030	1.4	0.2	370.6	32.2	12.7	417.1	-33.3	11.6	10.2
Melbourne	Present	1.4	178.5	33.0	32.2	12.7	257.8	-	-	-
	2030	1.4	149.5	43.0	32.2	12.7	238.8	-16.2	30.3	-7.4
Perth	Present	1.4	56.3	103.9	32.2	12.7	206.5	-	-	-
	2030	1.4	41.4	125.3	32.2	12.7	213.0	-26.5	20.6	3.1
Sydney	Present	1.4	59.8	37.5	32.2	12.7	143.6	-	-	-
	2030	1.4	48.0	46.9	32.2	12.7	141.2	-19.7	25.1	-1.7
Hobart	Present	1.4	217.6	8.5	32.2	12.7	272.4	-	-	-
	2030	1.4	197.8	10.5	32.2	12.7	254.6	-9.1	23.5	-6.5

Table 17. The comparison between the base case and fully retrofitted scenario.

Location	Period	Loads		Site energy					Site energy variation (%)		
		Heating	Cooling	DHW	Cooling	Lighting	Appliances	Total electricity	Heating	Cooling	Total electricity
Base case	Present	16.1	30.9	1.4	11.9	32.2	12.7	74.3	-	-	-
	2030	14.5	34.9	1.4	13.4	32.2	12.7	74.2	-9.1	12.6	-0.1
Retrofit	Present	1.6	20.2	1.4	4.0	8.8	12.7	28.6	-	-	-
	2030	1.4	22.9	1.4	4.6	8.8	12.7	28.8	-6.7	15.0	0.7

A ac e 1

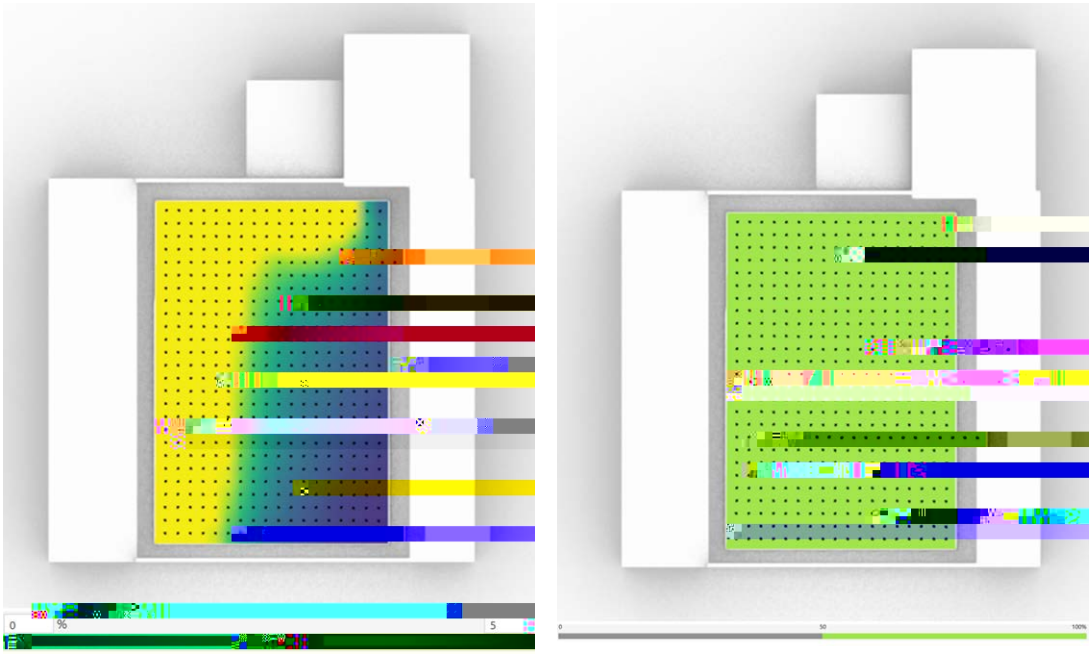
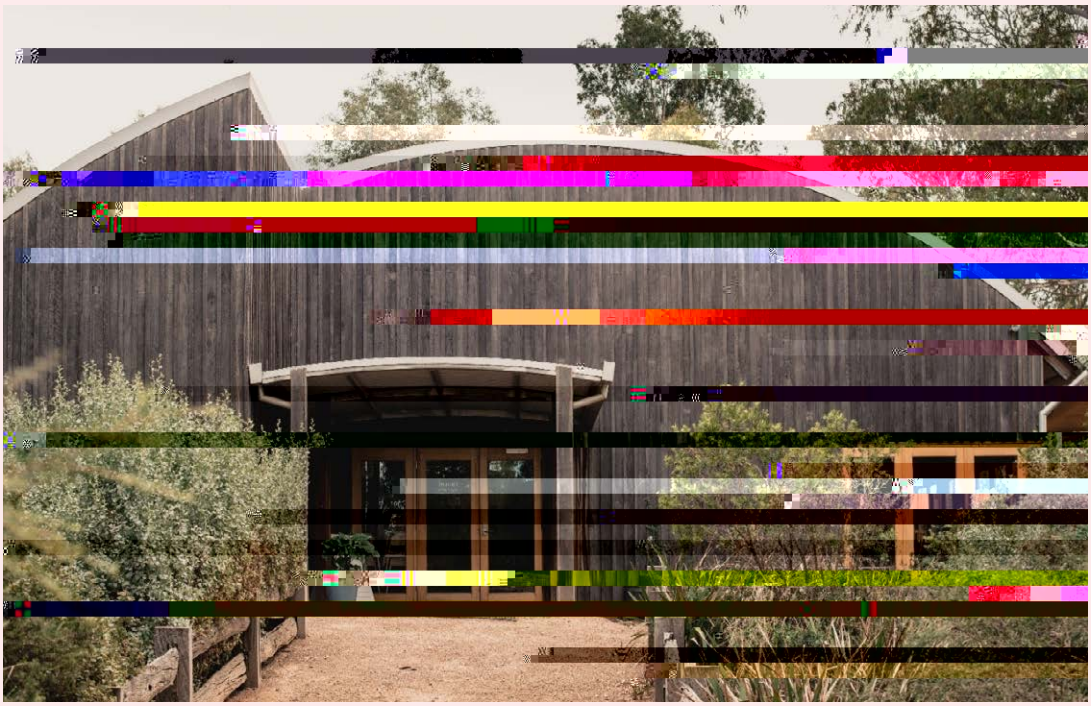


Fig. A1. Distribution of Average Daylight Factor.

A ac e 2



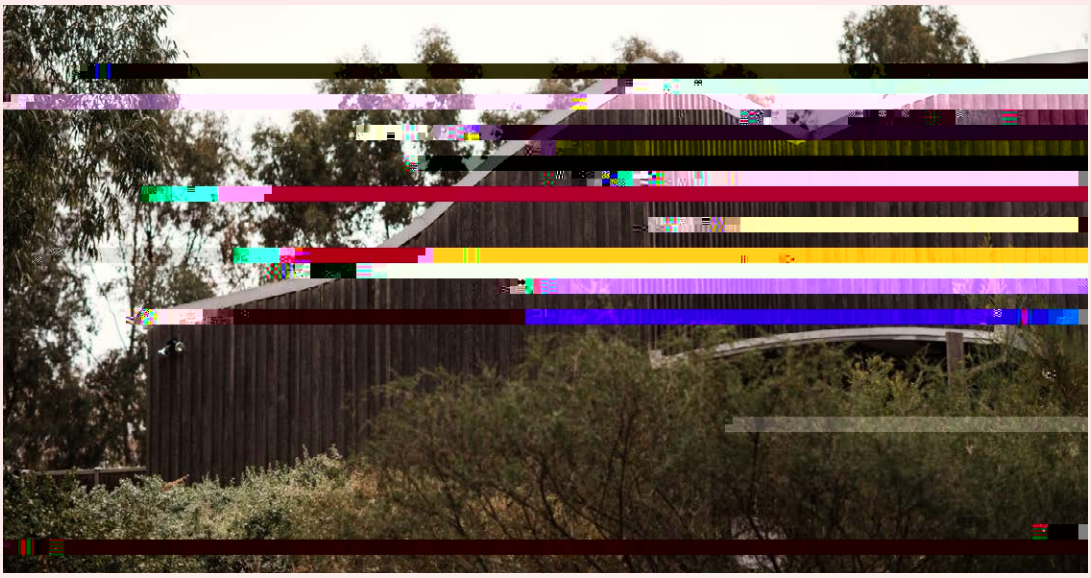


Fig. A3. Exterior views of the restaurant.

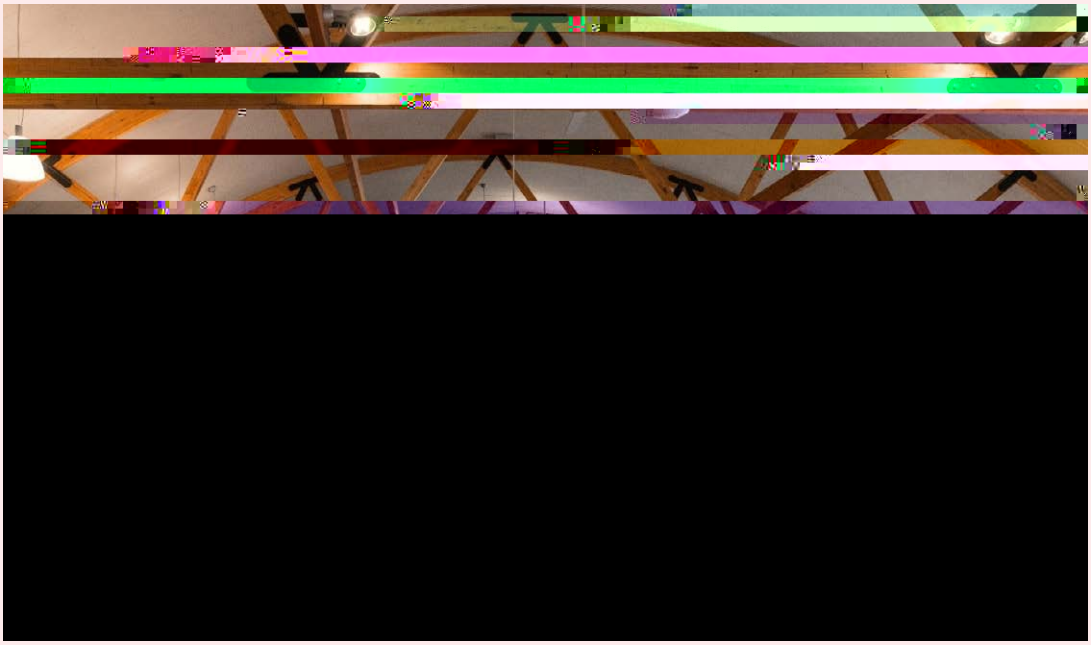


Fig. A4. Interior views of the restaurant.