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Title: Analysis and comparison of thermal lag in material of finishes type in dwellings of social interest in the city of Mexicali, Baja California

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Introduction

Global warming and climate change are still growing ; the concentrations of the Greenhouse Gas has increased, contributing to the development of global warming and temperature increase.

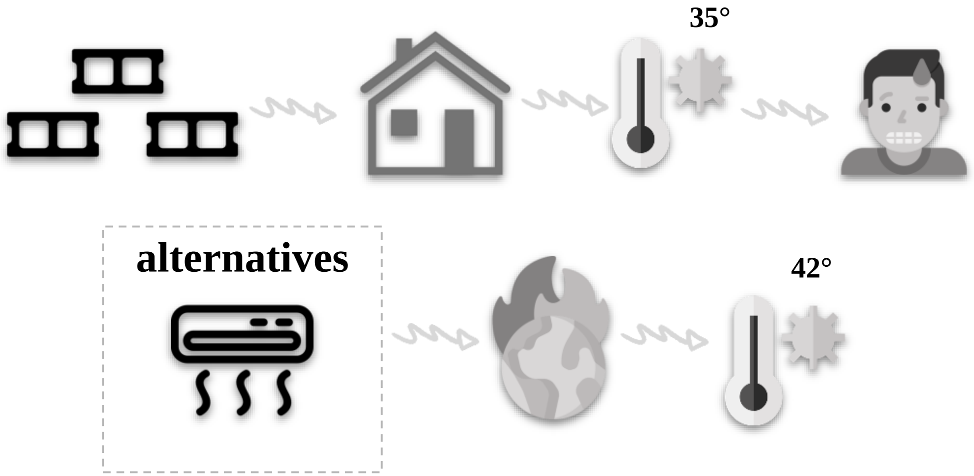
to consider

Climate context
Environmental conditions

Now, if you take into account the basic need that is the architecture and in a timely manner the house; it is characterized by being the main instrument to satisfy the thermal comfort to those who inhabit it.

however

Several investigations affirmed that dwellings's constructive methods lack of thermal benefits for their users



VIDEO

Alejandro Aguilar
architecture student

Introduction

That's the reason, there’s a need to search for **efficients alternatives** that contribute to a thermal reinforcement of house facades.

There are a great number of researches that study walls and roofs materials, they conclude that the **application of thermal insulators or thermal retardants** in facades are one of the **most efficient alternatives** in reducing the thermal transmittance

Several companies continue a constant **innovation and developmen**t of materials and construction systems

Nevertheless, it is required to **prove and analyze** that the materials fulfill the necessary characteristics to provide a thermal support

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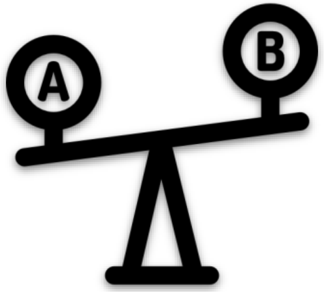
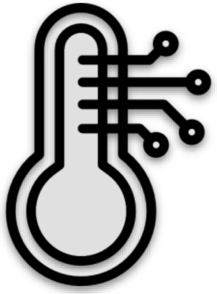
Objective

The objective of the present investigation was to **analyze the thermal behavior** of a material which pledges **efficient thermal lag qualities** in comparison with **traditional plastering**





The object of study was the city of **Mexicali, Baja California** where two cases of study were compared, under traditional construction systems of the region as it **is the masonry block,** nonetheless, one of them bears the **thermal retardant** (Thermorock ®)

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Methodology

Methodology

This research is developed following a **thermal logger monitoring method**. We considered other similar papers as references to elaborate the methodology of this article.

Research design

This research was carried out with a monitoring scheme and comparison

Unit differences of both external and internal surface temperature register through a thermal logger

This scheme was applied in two model houses

Both of them were constructed with the city's conventional construct system (Mexicali, Baja California, México)

The monitoring was done on a specific period

The months of November and January stood out and were categorized as transition and cold periods respectively.

Therefore its classification allowed an analysis and conclusions

Technical reports and scientific dissemination material

It is important to emphasize that during the process of investigation and application the following normatives were consulted; **ISO-9869-1:2014** and the norm **ASTM C 168-97**

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Methodology

Two kinds of temperature loggers were used in this research, for environment temperature we used a **thermal stress sensor RC-51H** model that has a EN12830 certificate, CE, RoHS, for surface temperature we used a four **channel logger thermometer** (4 channel K thermometer SD Logger). Both sensors were programmaded on fields.

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Application area

This study was realized in Mexicali, Baja California, Mexico, this city has a BW climate (Koppen-Garcia categorize), which indicates that is an **arid, dry climate, it has rainy winters and an annual very extreme temperature oscillation** (Ley et al, 2011).

Location of Mexicali, Baja California.
Source: Mapbox

Location Ángeles de Puebla, Mexicali Baja California.
Source: Google Map Style.

The annual **average temperature is 22.4°C**, the warmest season is june to september whose average **temperature is 33.1**°C and it can get to a **maximum of 42.2°C**; meanwhile the coldest seasons correspond from December to January, in this period the monthly average temperature is **12.4°C**

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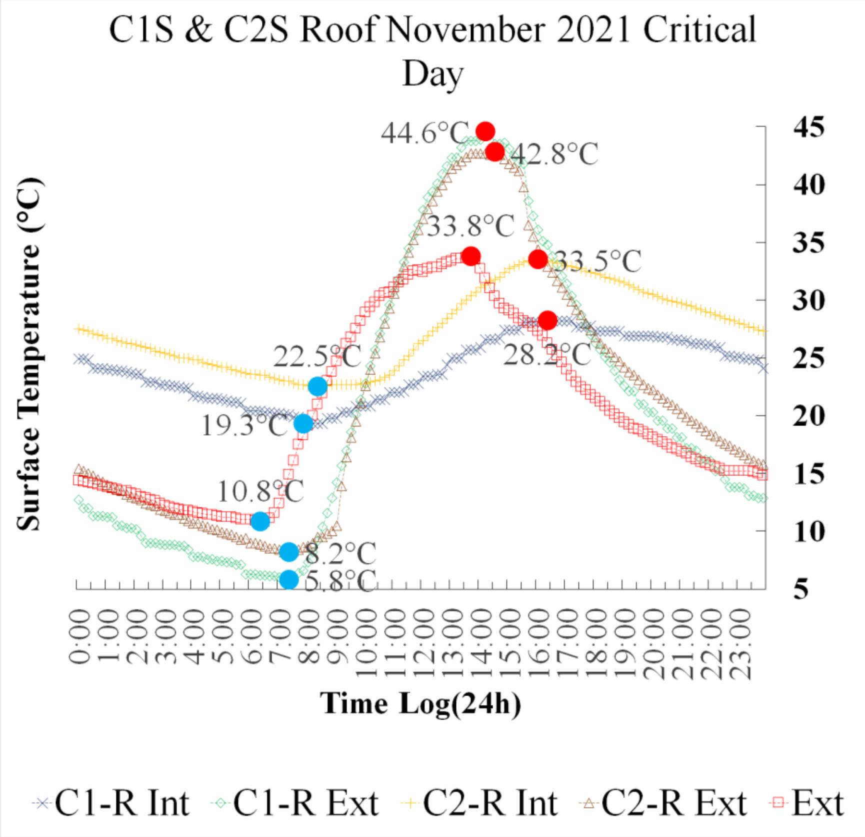
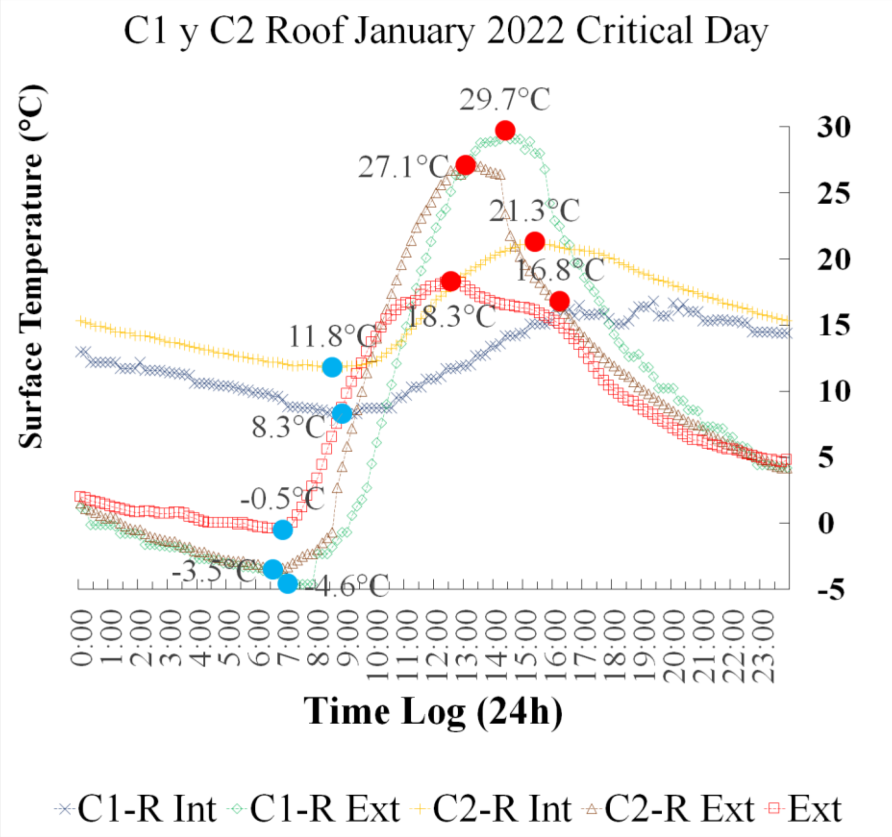
Results

Results: Roofs
Transition Period - Cold Period





		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	33.8°C	10.8°C	23°C
C1-R Int	C1- Internal side Roof	28.2°C	19.3°C	8.9°C
C1-R Ext	C1- External side Roof	44.6°C	5.8°C	38.8°C
C2-R Int	C2- Internal side Roof	33.5°C	22.5°C	11°C
C2-R Ext	C2- External side Roof	42.8°C	8.2°C	34.6°C

		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	18.3°C	-0.5°C	18.8°C
C1-R Int	C1- Internal side Roof	16.8°C	8.3°C	8.5°C
C1-R Ext	C1- External side Roof	29.7°C	-4.6°C	34.3°C
C2-R Int	C2- Internal side Roof	21.3°C	11.8°C	9.5°C
C2-R Ext	C2- External side Roof	27.1°C	-3.5°C	30.6°C

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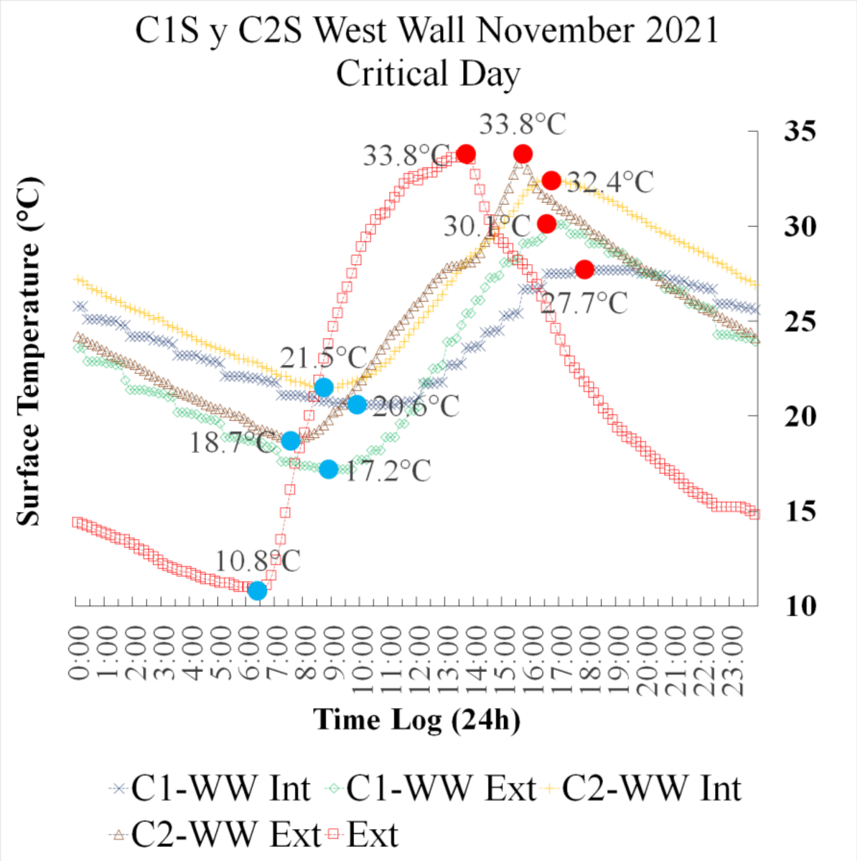
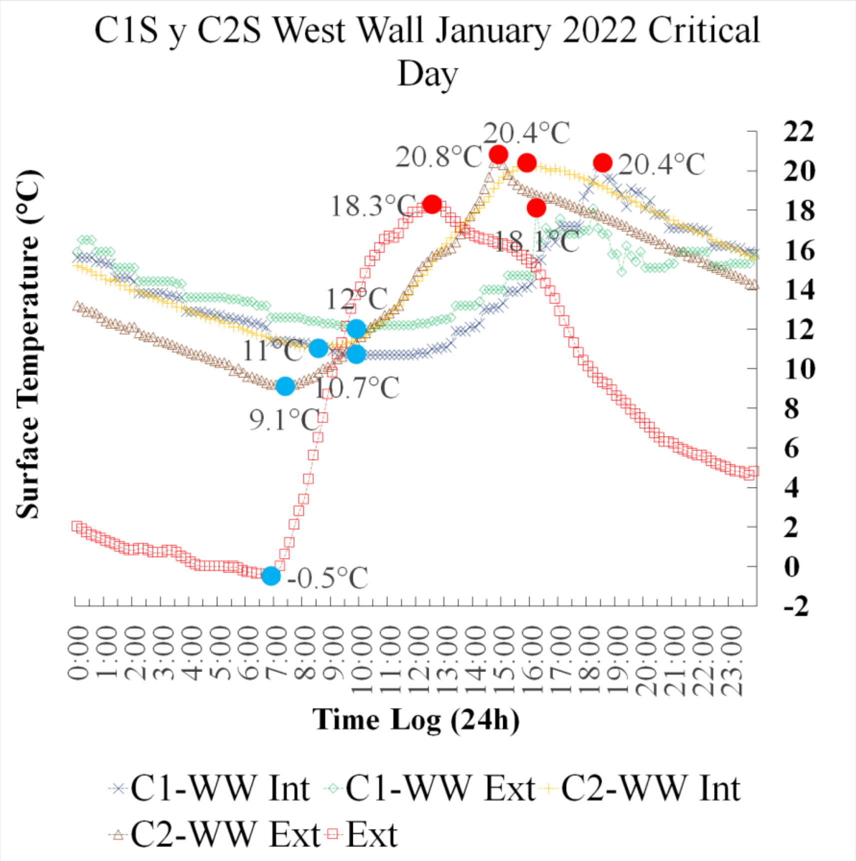
Results: West Wall
Transition Period - Cold Period



		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	33.8°C	10.8°C	23°C
C1-WW Int	C1- Internal side West Wall	27.7°C	20.6°C	7.1°C
C1-WW Ext	C1- External side West Wall	30.1°C	17.2°C	12.9°C
C2-WW Int	C2- Internal side West Wall	32.4°C	21.5°C	10.9°C
C2-WW Ext	C2- External side West Wall	33.8°C	18.7°C	15.1°C



		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	18.3°C	-0.5°C	18.8°C
C1-WW Int	C1- Internal side West Wall	20.4°C	10.7°C	9.7°C
C1-WW Ext	C1- External side West Wall	18.1°C	12°C	6.1°C
C2-WW Int	C2- Internal side West Wall	20.4°C	11°C	9.4°C
C2-WW Ext	C2- External side West Wall	20.8°C	9.1°C	11.7°C

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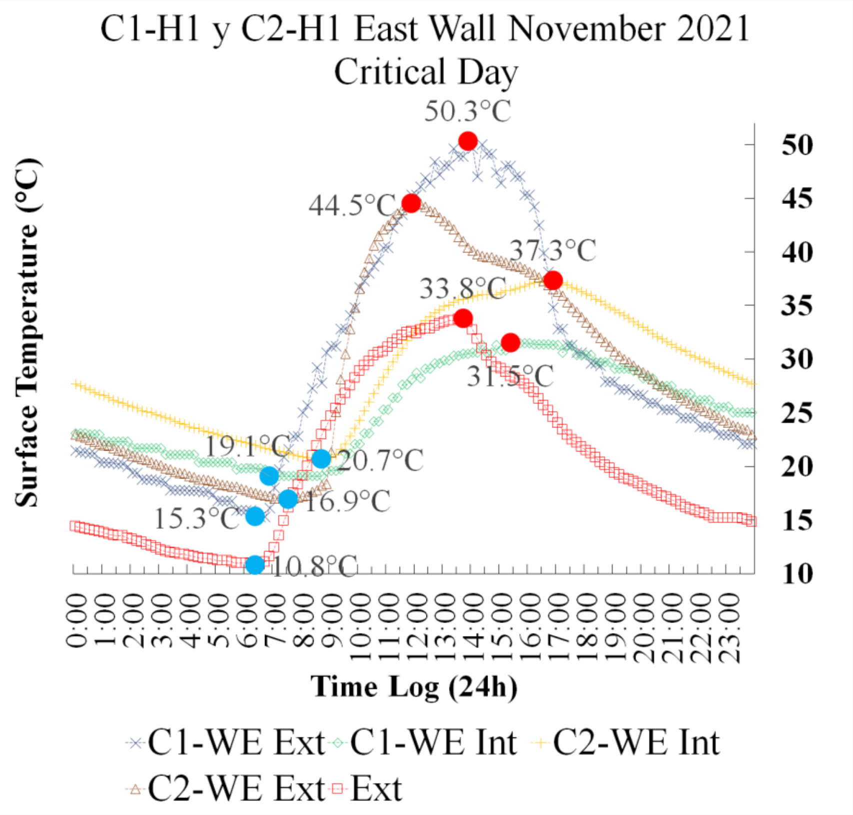
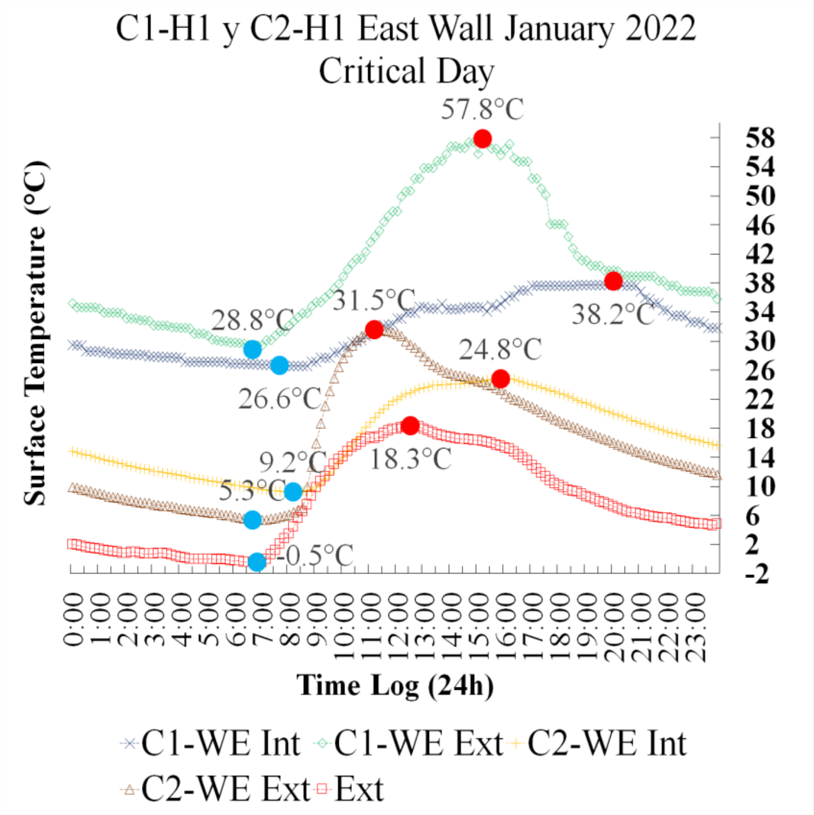
Results: East Wall
Transition Period - Cold Period





		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	33.8°C	10.8°C	23°C
C1-WE Int	C1- Internal side East Wall	31.5°C	19.1°C	12.4°C
C1-WE Ext	C1- External side East Wall	50.3°C	15.3°C	35°C
C2-WE Int	C2- Internal side East Wall	37.3°C	20.7°C	16.6°C
C2-WE Ext	C2- External side East Wall	44.5°C	16.9°C	27.6°C

		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	18.3°C	-0.5°C	18.8°C
C1-WE Int	C1- Internal side East Wall	38.2°C	26.6°C	11.6°C
C1-WE Ext	C1- External side East Wall	57.8°C	28.8°C	29°C
C2-WE Int	C2- Internal side East Wall	24.8°C	9.2°C	15.6°C
C2-WE Ext	C2- External side East Wall	31.5°C	5.3°C	26.2°C

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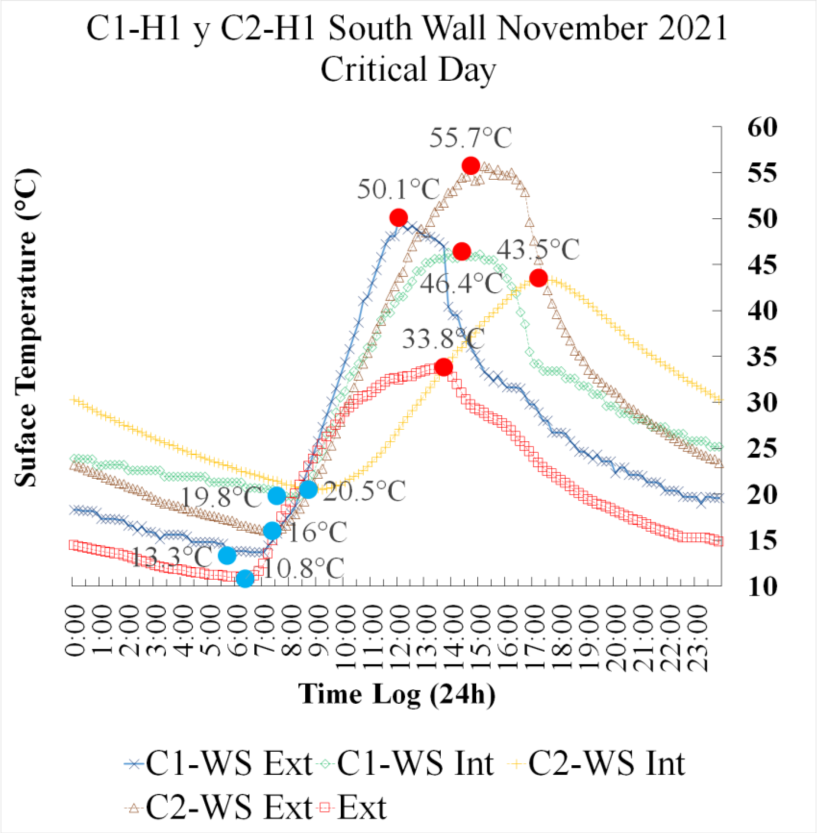
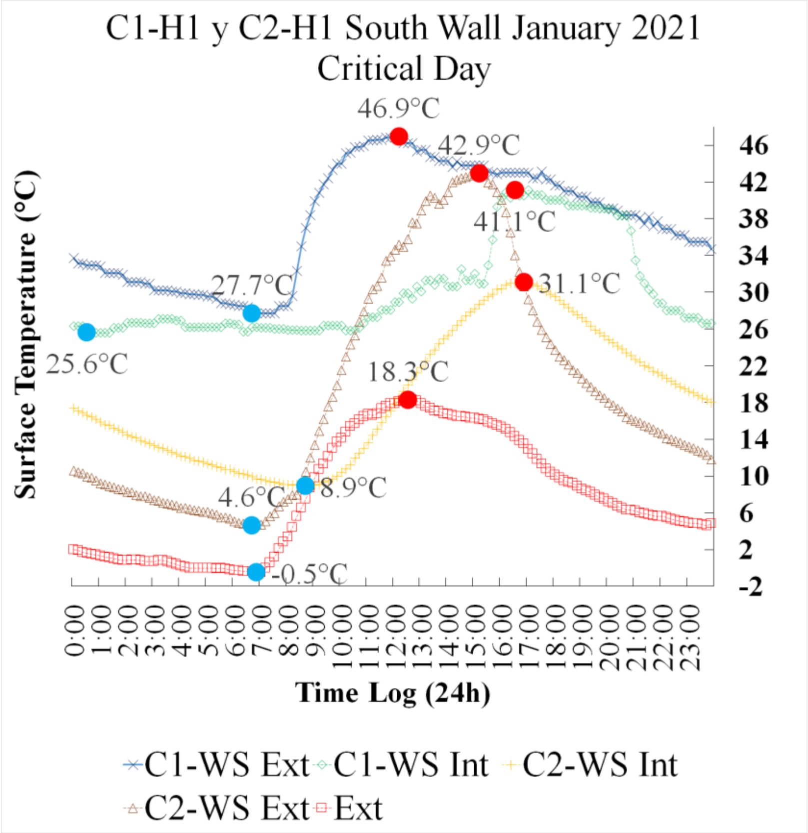
Results: South Wall
Transition Period - Cold Period





		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	33.8°C	10.8°C	23°C
C1-WS Int	C1- Internal side South Wall	46.4°C	19.8°C	26.6°C
C1-WS Ext	C1- External side South Wall	50.1°C	13.3°C	36.8°C
C2-WS Int	C2- Internal side South Wall	43.5°C	20.5°C	23°C
C2-WS Ext	C2- External side South Wall	55.7°C	16°C	39.7°C

		Surface Temperature °C		Oscillation
		Maximum	Minimum	
Ext	Environment	18.3°C	-0.5°C	18.8°C
C1-WS Int	C1- Internal side South Wall	41.1°C	25.6°C	15.5°C
C1-WS Ext	C1- External side South Wall	46.9°C	27.7°C	19.2°C
C2-WS Int	C2- Internal side South Wall	31.1°C	8.9°C	22.2°C
C2-WS Ext	C2- External side South Wall	42.9°C	4.6°C	38.3°C

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Conclusions

Conclusions

During this period it was observed a decrease in the thermal oscillation between the surfaces of both cases of study, thus a clear tendency to a major stability in the housing, where it was applied an extra covering, which was our research objective.

Positive results of C1 in comparison to C2 per period

Transition Period

WW	West Wall	3.1°C
WE	East Wall	4.2°C
R	Roof	2.1°C

Cold Period

R	Roof	1.0°C
WE	East Wall	4.0°C
WS	South Wall	6.7°C

It can be concluded that the use of the finish material studied in this paper in construction systems helps the thermal lag and reduction of superficial temperature. This allows the possibility to reduce earnings and heat loss inside the habitable space and facility in the control of environmental temperature.

VIDEO

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