



## Diagonals insulation system

The three main modes of heat loss: radiation, conduction, and convection.

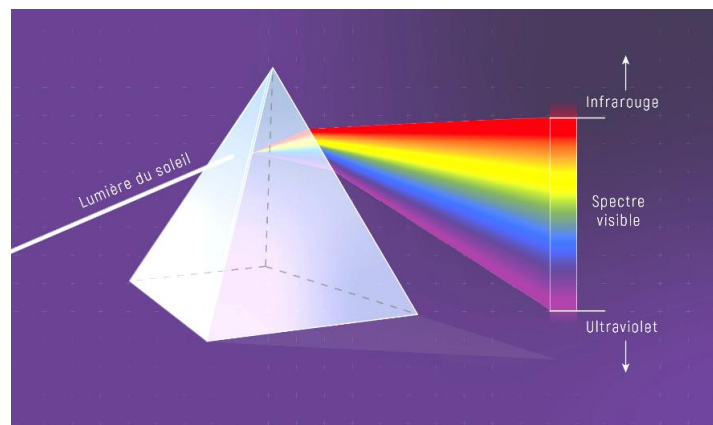
### 1. HEAT LOSS BY RADIATION

#### 1.1 The nature of radiation

Daylight is a synthesis of a wide range of radiations of different wavelengths, including infrared radiation, or thermal radiation. This radiation, invisible to the naked eye, is the main carrier of the heat contained in solar radiation.

A transparent object, which by definition allows light to pass through, allows the infrared radiation to pass through, as well as the associated heat.

Antithermal films are designed to filter and block the infrared radiation. They allow only the rest of the light spectrum to pass through.



Sunlight decomposed by a prism

*Canadian Space Agency*

#### 1.2 The Effects of infrared radiation

Infrared radiation transforms into heat upon contact with bodies that do not allow it to pass through. The antithermal films that block this radiation are therefore heated in the same proportions. The heat transmitted by conduction will also increase in the same proportions.

## **2. HEAT LOSS BY CONDUCTION**

Heat loss by conduction occurs through direct contact between two objects with different temperatures. Air is the best insulator against heat loss by conduction, from technical and economical point of view. A layer of air is inserted between the internal and external environments.

However, this layer of air results in another problem: heat loss by thermal convection.

## **3. HEAT LOSS BY CONVECTION**

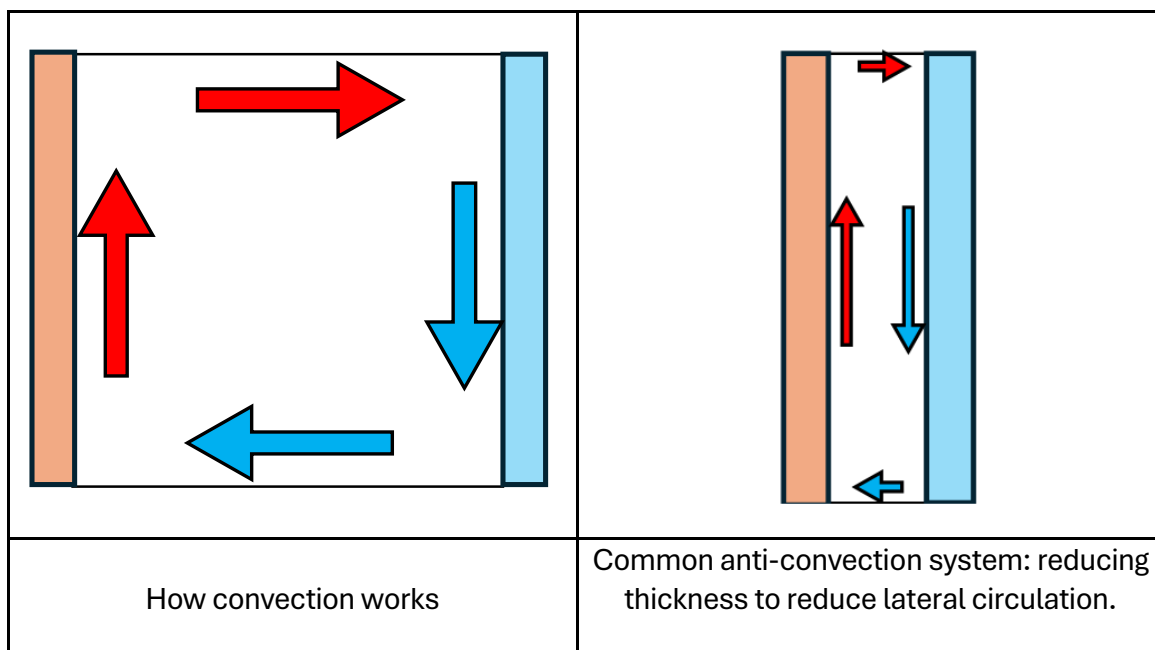
### **3.1 Thermal convection**

Heat loss by convection occurs due to the movement of the gas used in insulation, usually air. When it comes into contact with the internal side of the insulating space, it gains heat, its density decreases, and it rises. In contrast, the air in contact with the external side cools and goes down. A continuous circuit is then established, causing the air to absorb heat from the warm side and transfer it to the cooler side.

The slightest difference of temperature is enough to trigger this phenomenon. The insulation methods must be able to stop this cycle, or to strongly cut it down.

### **3.2 The common anti-convection technique**

The usual anti-convection techniques consist of enclosing the insulating air in very narrow space: around 10mm for double or triple glass panes.



This principle is also applied in walls insulation by enclosing the air in small bubbles, made of an insulating material. In this case, it can be considered that it is not the air that is insulating, but the material which the air is contained in: glass wool, rock wool, hemp wool, silica aerogel, etc. The

role of air being mainly reducing density of the actual insulation, for reasons of cost, weight, and effectiveness.

### 3.3 A new anti-convection concept

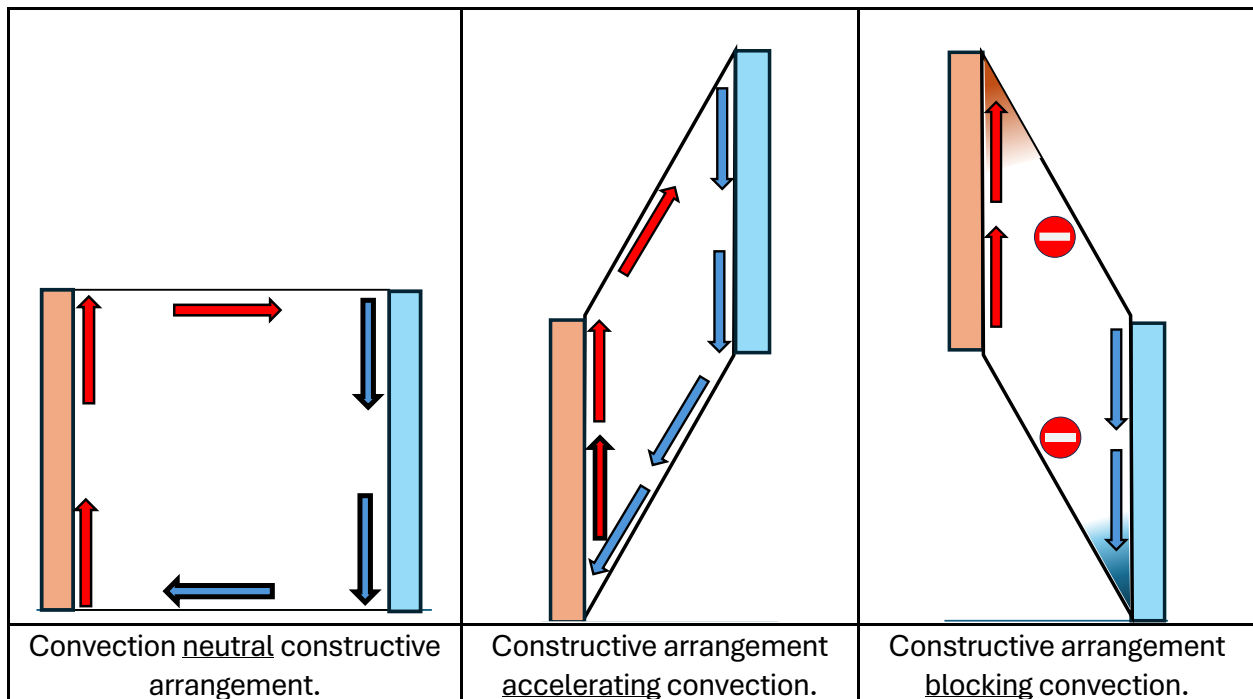
A new anti-convection concept consists of installing diagonals oriented in such away warm air is blocked against the warm side of the insulating space, and cool air is blocked against the cool side.

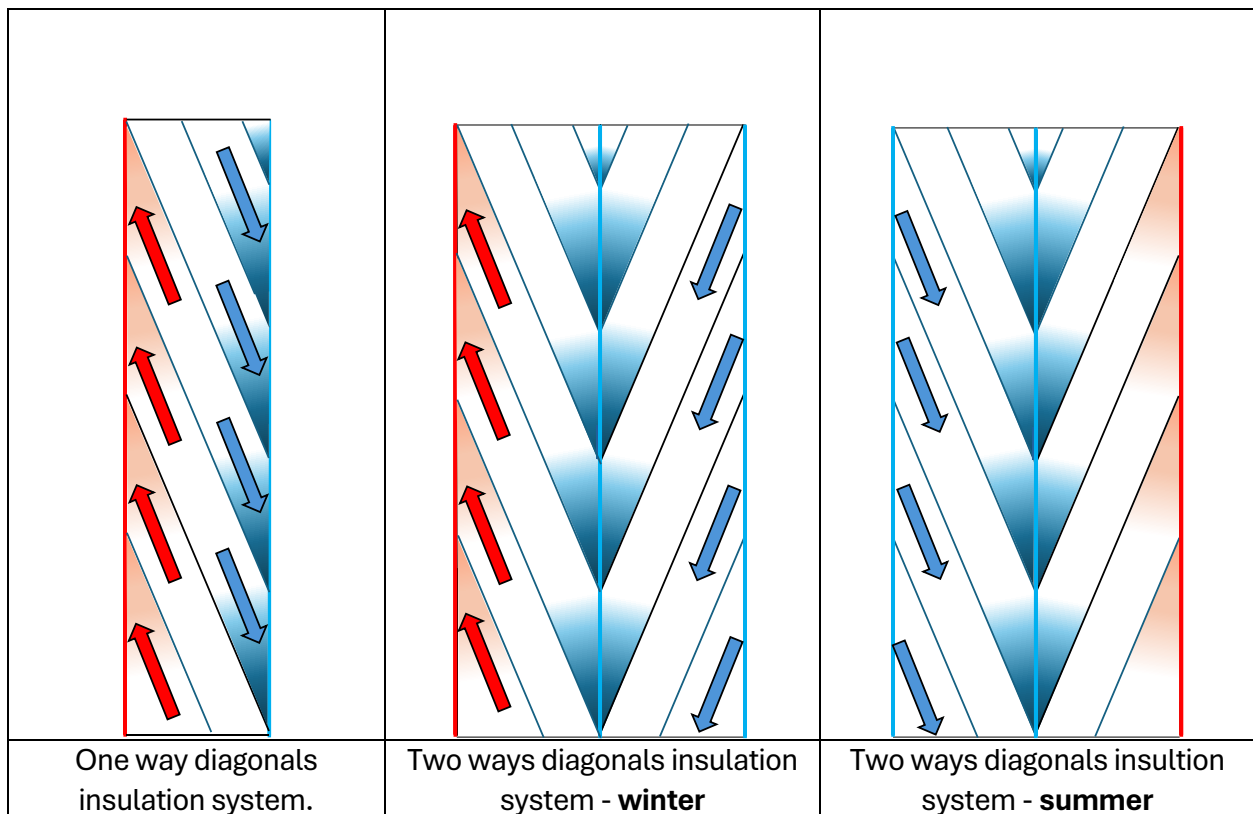
In winter, the warm side corresponds to the interior side, and the cool wall corresponds to the exterior side. It is the opposite in summer. A double effect diagonals system is then to be considered.

This system stops convection, and thus allows a greater thickness of air in insulation space to reduce heat loss by conduction.

For glass surfaces, diagonals are made of thin and transparent panels: window glass, various polymers such as plexiglass, polycarbonates, transparent PVC, etc.

#### How it works.





#### **4. IMPLICATIONS OF THE NEW CONCEPT**

##### **4.1 Implications from an architectural perspective**

Currently, orientation of large openings of buildings towards the facades subjects to strong sunlight is not recommended. It would result in too much heat entering into the building in summer.

The new concept, combined with an appropriate antiradiation film results in thermal performance comparable to that of walls. Therefore, buildings may now be designed with openings as large as suitable, and oriented in any direction without fear of heat loss in winter, and excessive heat gain in summer.

**4.2** The diagonals thickness is the range of mm, so that the total light loss is low.

##### **4.3 Implications from an urban management perspective**

If taken into account, the concept would reduce concerns regarding orientation of streets for urban planners, for the layout of streets in new allotments.

##### **4.4 For tall buildings**

Tall buildings benefit the most from the new concept. Regardless of their orientation, they always have large areas fully exposed to solar radiation. Combination of diagonals insulation system and antiradiation films, would result in synergy of the two.

**5. Patent pending**

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**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**

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**Title of Invention**

Thermal insulation using trapped fluids

**Application Information**

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	7012	FILED BY	Libere Nitunga
PATENT CENTER #	74887227	FILING DATE	-
CUSTOMER #	204278	FIRST NAMED INVENTOR	Mr. Libere Nitunga
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	-

**Documents****TOTAL DOCUMENTS: 6**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
generatedADS74687227.pdf	5	Application Data Sheet	112 KB
260303_Thermal_Insulation_using_trapped_fluids_drawings.pdf	3	Drawings-only black and white line drawings	175 KB
260303_Thermal-Insulation_using_trapped_fluids_SPEC-SPEC.docx	7	Specification	36 KB
260303_Thermal_Insulation_using_trapped_fluids_Claims-CLM.docx	1	Claims	16 KB
260303_Thermal_Insulation_using_trapped_fluids_Abstract-ABST.docx	1	Abstract	16 KB