

Theory of comfort



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Man permanently exchanges heat with his environment.

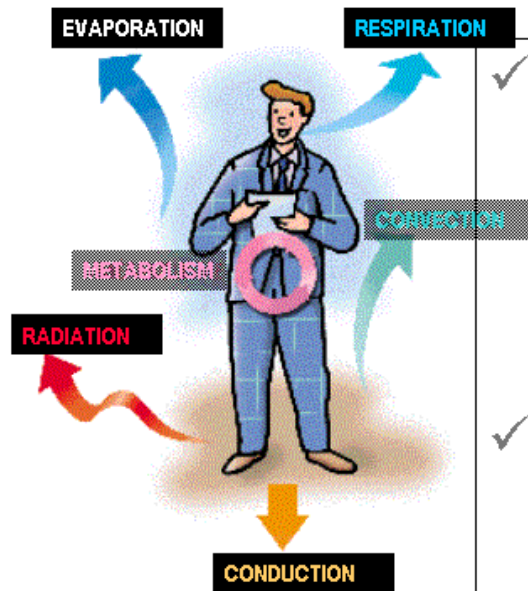
- Too rapid a heat loss causes a sensation of cold.
- The organism is able to maintain its thermal balance by using unpleasant additional regulation mechanisms such as shivering.

Therefore it is necessary to reach a thermally neutral point

- which coincides with the imperceptible loss of the body's calories,
- without imbalance and without a feeling of general discomfort.



Parameters



- ✓ Environment parameters :
 - ✓ Dry bulb air temperature (C°)
 - ✓ Air velocity (m/s)
 - ✓ Radiant temperature(C°)
 - ✓ Relative humidity (%)
- ✓ Individual parameters :
 - ✓ Activity (met)
 - ✓ Clothes (clo)



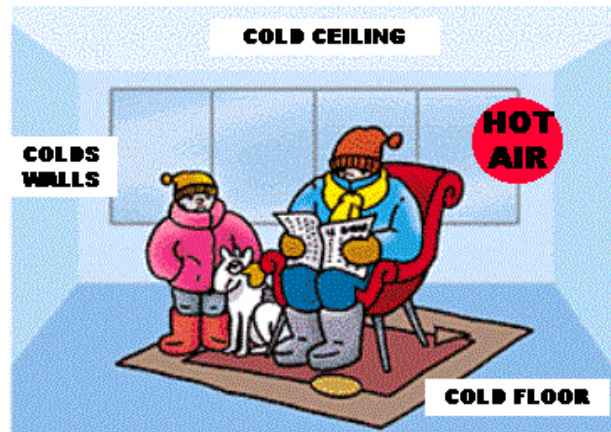
Criteria of comfort

Thermal discomfort depends on 5 criteria:

- Horizontal temperature uniformity
- Draughts (air velocity)
- Asymmetry of radiant heat
- Temperature difference between head and feet
- Warm or cold floor



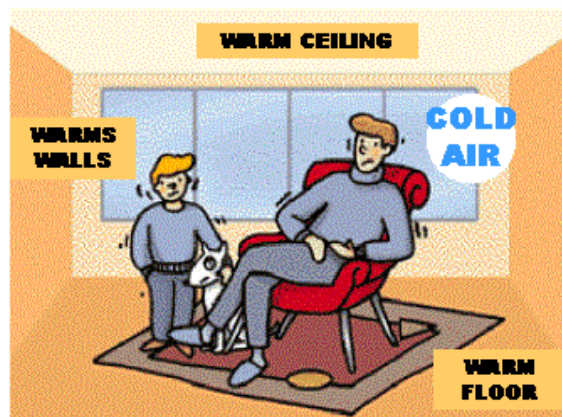
Air temperature



AIR to 40°C
+
COLDS WALLS (-10°C)
=
TOO COLD



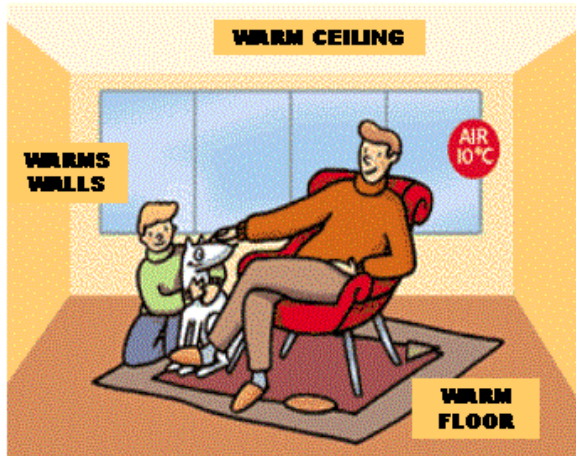
Walls temperature



AIR to 5°C
+
WALLS to 25°C
=
Non Comfortable



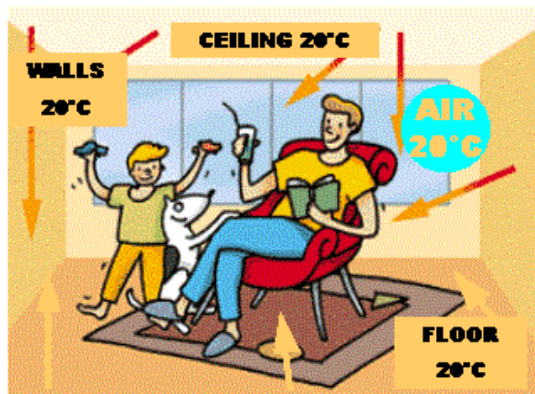
Room temperature



$$\begin{aligned} & \text{AIR to } 14^{\circ}\text{C} \\ & + \\ & \text{WARMS WALLS} \\ & \quad (26^{\circ}\text{C}) \\ & = \\ & \text{ACCEPTABLE} \end{aligned}$$



Comfort temperature



$$\begin{aligned} & \text{Temperate air } 20^{\circ}\text{C} \\ & + \\ & \text{Temperates walls} \\ & \quad 20^{\circ}\text{C} \\ & = \\ & \text{COMFORT} \end{aligned}$$



Comfortable environment

Is defined by :

- **Comfort temperature θ_c : 18°C**

In accordance with :

- air temperature θ_a ,
- Temperature of walls and surfaces θ_w ,

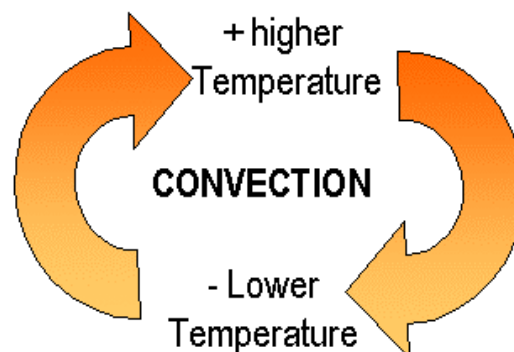
$$\theta_c = (\theta_a + \theta_w) / 2$$

And also by :

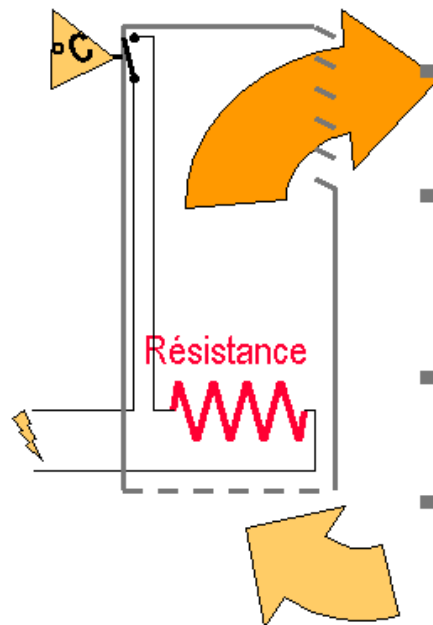
- **air velocity : < 0,25 m/s**
- **relative humidity : 40 à 60%**

Free convection

Heat transmission by movement of a fluid caused by density differences due to temperature variations.



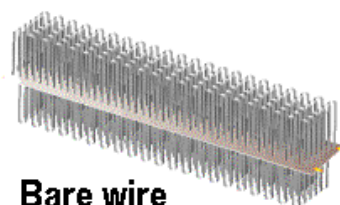
Principe du convecteur



The heating element heats by Joule effect

- The aluminium finned diffuser increase heat exchange with air
- The metal body increases the chimney effect
- The front directional outlet grille

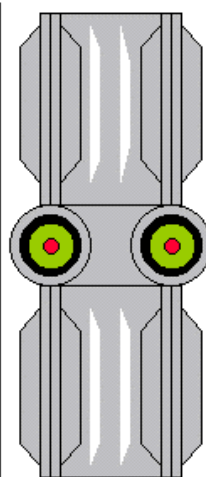
HEATING ELEMENT



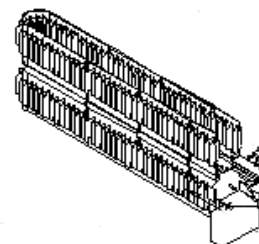
Bare wire

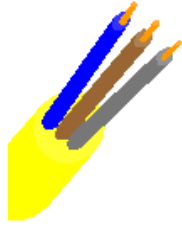


Tubular heating element



Sheathed heating element stainless steel with aluminium Diffuser (ELITE, ECOFLEX)

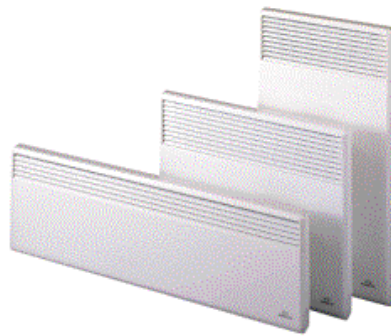




FENIX

Type of convectors with suitable parameters for efficient convection

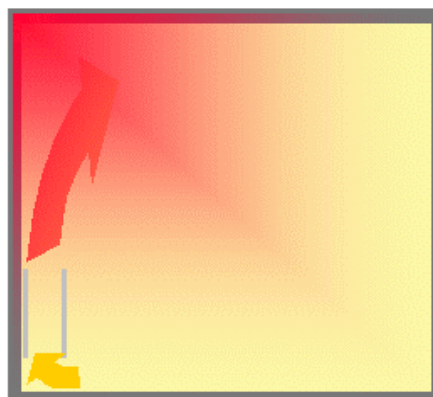
ELITE 3D



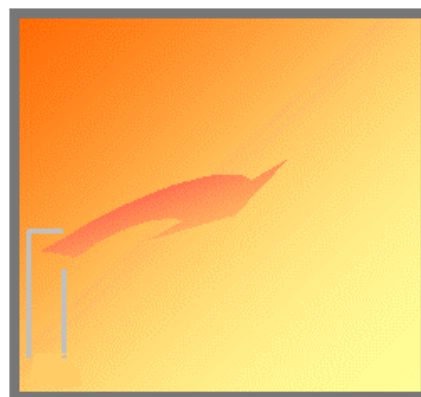
ECOFLEX



Air outlet



Vertical air outlet

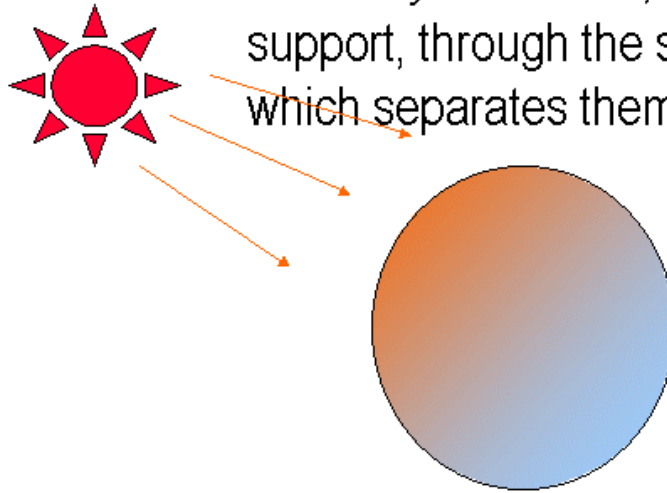


The best diffusion with the front directional outlet

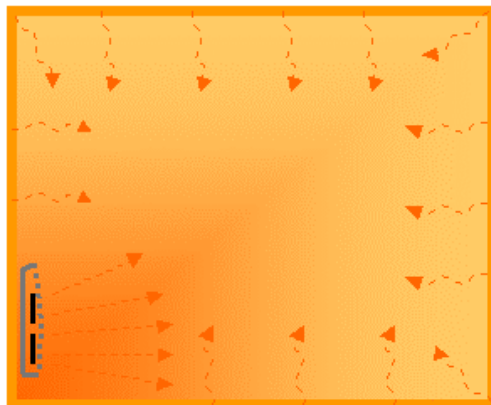


Radiation

- Transmission of energy from one body to another, without support, through the space which separates them.



Radiation advantages



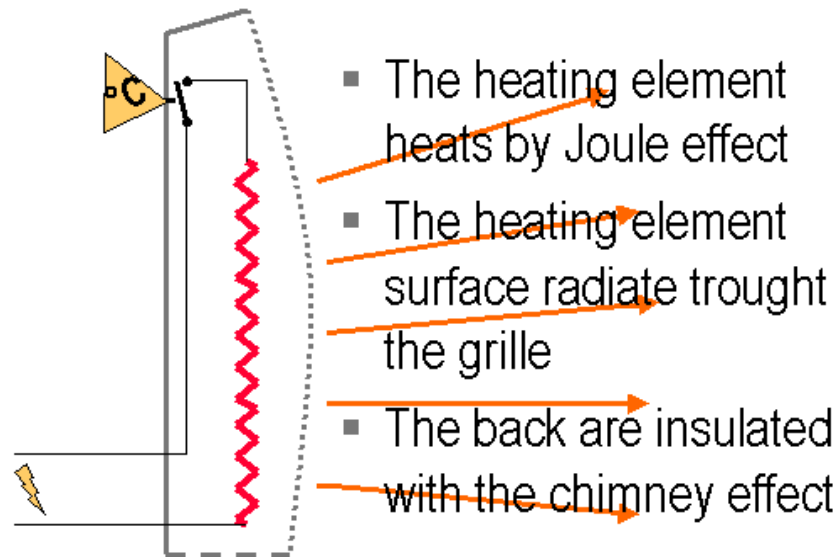
Comfort :

- Temperates walls
- Temperature uniformity

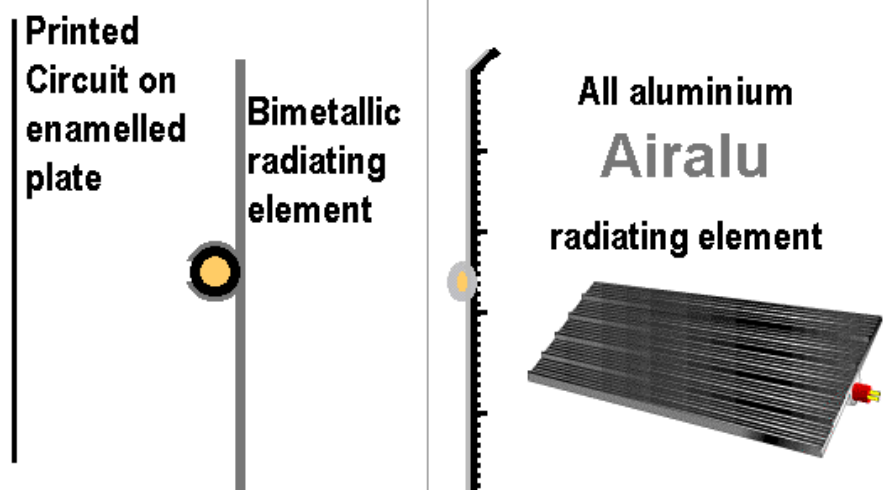
Economy :

- Lower air temperature
- The air stratification are limited

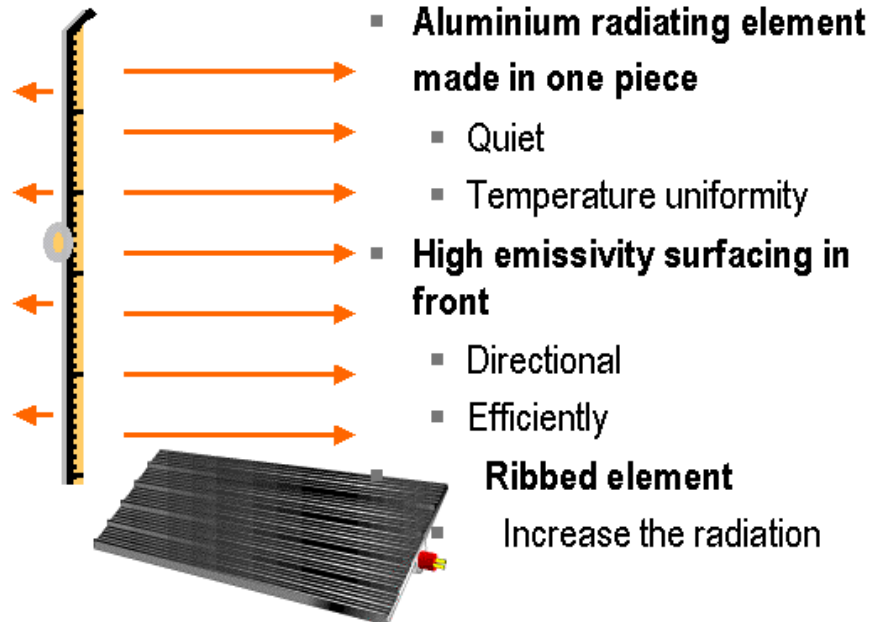
Principle of radiant panel



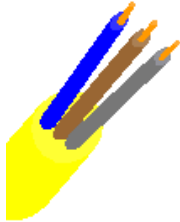
Radiating element



AIRALU element (Prestance 2)



FENIX 



Type of radiant pannel

PRESTANCE 2

