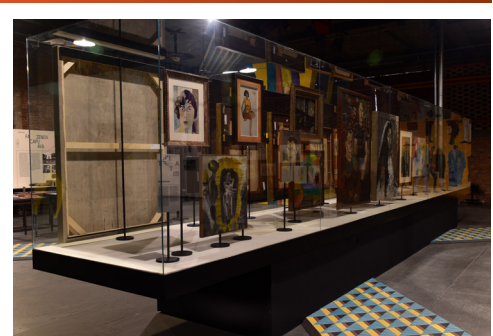
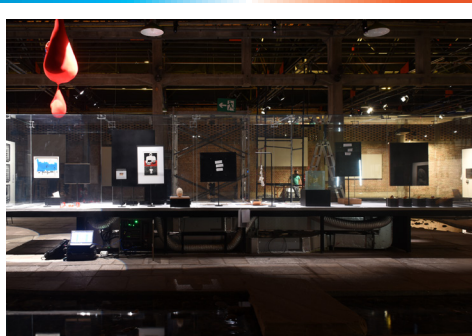
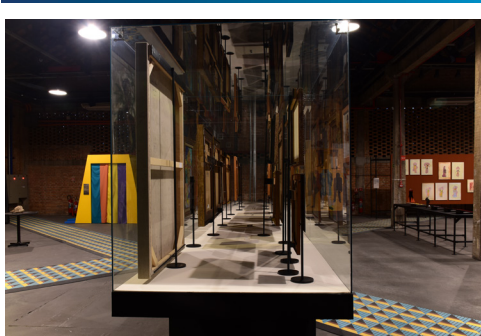
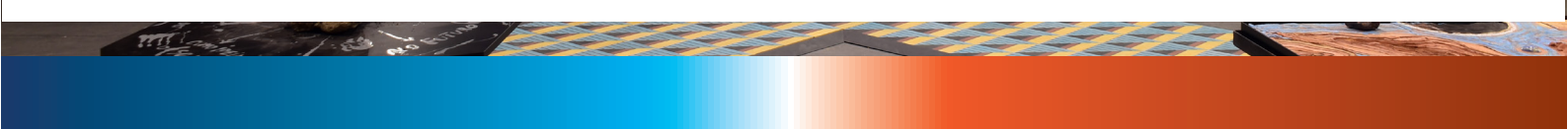


E&B - SPECIAL DESIGNS

Thermic Sytems and HVAC solutions



EITRI & BROKK
SPECIAL DESIGNS
THERMIC SYSTEMS AND HVAC SOLUTIONS

SPECIAL DESIGN - ARTWORK HVAC SHOWCASE

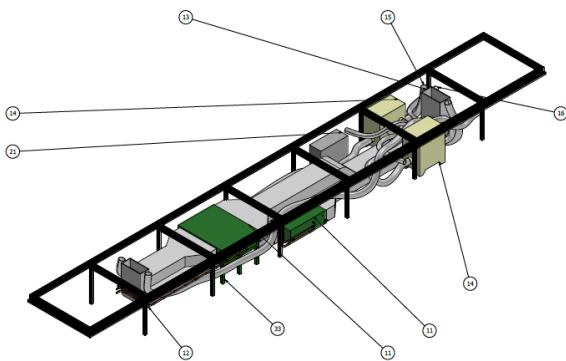


The E&B HVAC showcase provides great control of the internal atmosphere temperature and relative humidity, without having any equipment on display and without the need for external or environmental HVAC system, allowing its application in places where normally it would not be possible to exhibit art works that need special air conditioning parameters. The project is developed according to the client's requirements and together with the exhibition production, where we have as input data, the desired dimensions of the showcase, the environmental parameters inside the showcase and the applicable noise restrictions.

Our entire service and project are carried out by a high standard specialized team, thus ensuring high performance of the HVAC system and guaranteeing reliability in development and execution (assembly, operation and maintenance).

The equipment can be assembled on a temporary or permanent basis depending on the needs of the location or client. The minimum assembly time is 25 days.

The Artwork HVAC showcase can assume several sizes and shapes, respecting the minimum size of 6.50m x 1.35m in its base (approx. 21.5ft x 4.5ft) and 8.00m x 1.40m for the showcase (approx. 26.2ft x 4.6ft). For more dimensional details [click here](#).



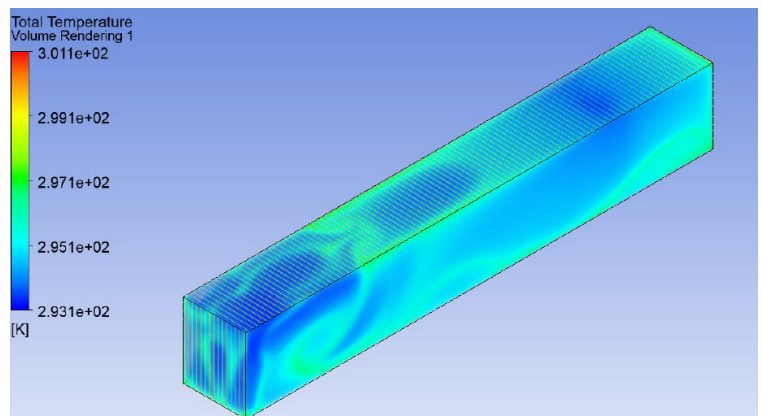
The scope execution consists on focusing at the preliminary design stages, assembly and installation details and a schedule for the supply of materials and services. We also provide all technical support and follow-up during the installation phase.

The high level of detailing seeks to avoid rework during installation, making it a project of HIGH STANDARD project from its conception to its final operation phase.

All equipment has redundancies in the system which ensures stability in operation and in case of failure and maintenance.

The development of thermal engineering, with the project already approved and established, will simulate the best climate control strategy through computer simulations of fluids, thus obtaining the distribution of the internal air flow, critical points for sealing and the thermal gradient inside the hermetic showcase.

Despite being a theoretical model, this phase ensures greater operational safety, thus certifying that the ideal HVAC parameters were obtained.



Required parameters for the showcase
 Relative Humidity: 50% RH \pm 10% RH
 Dry bulb temperature: 21°C \pm 2°C
 Note: Variation observed over a 24-hour period
 No relative humidity variation higher than 10% RH within 24h.
 No temperature variation higher than 2°C within 24h.



Average Temperature 21.9°C	Average R.H. 50.9%
Return Duct 21.4 °C	Return Duct 51.8 %
Showcase 1 21.5 °C	Showcase 1 51.7 %
Showcase 2 22.3 °C	Showcase 2 50.1 %

Data Read Timestamp

03/09/22 19:29:37

Options Menu

- Measure history - Temp
- Measure history - R.H.
- Graph - Temp
- Graph - R.H.
- Back

E&B monitors and controls the showcase HVAC system remotely, without the need to open the showcase, preserving the thermal stability and physical safety of the exhibited collection. The remote access guarantees 24-hour checking and agility in decision making, system stability and conducting the best adjustments for an active window acclimatization.

E&B's exclusive control and monitoring system has an algorithm which automatically searches for dead zones where active operation is not necessary 100% of the time.

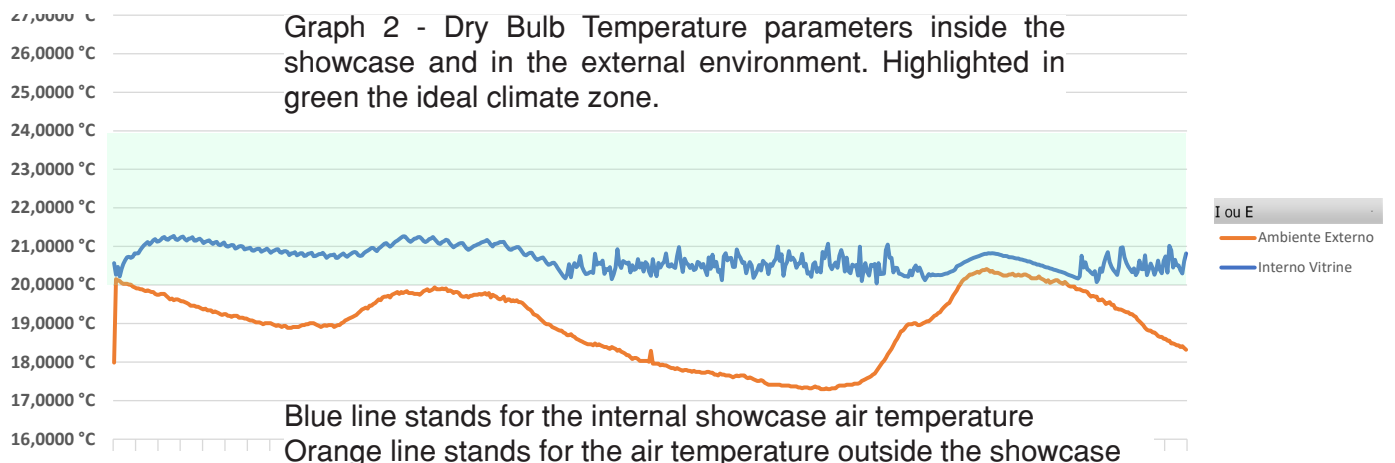
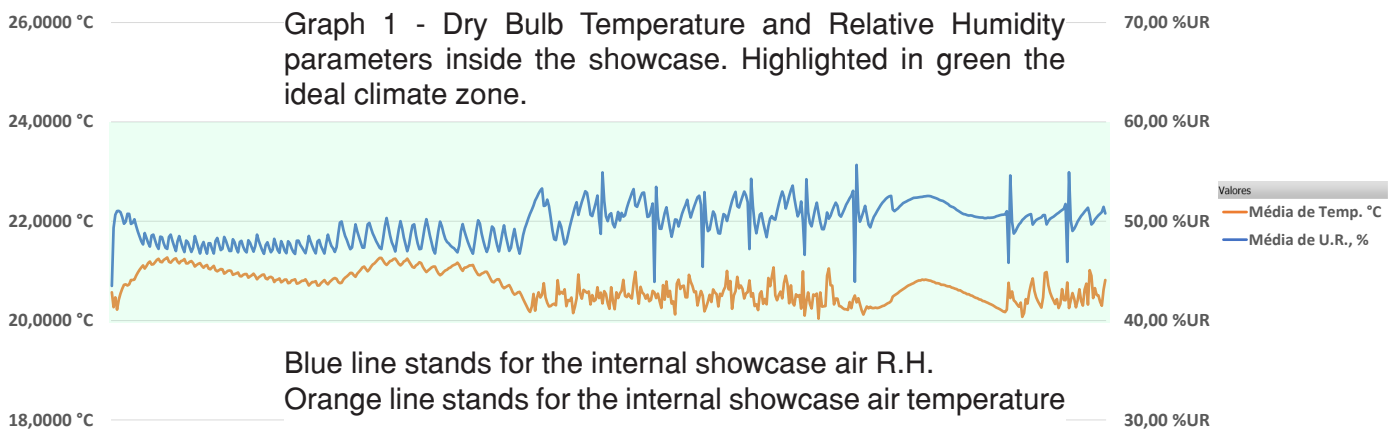
The temperature and relative humidity graph below shows the stability within the ideal climate zone (in green). Graphs 2 and 3 also show the internal parameters against the external environment parameters.

Such processes result in a better application of the system's energy, which generates energy efficiency and consequently, savings.

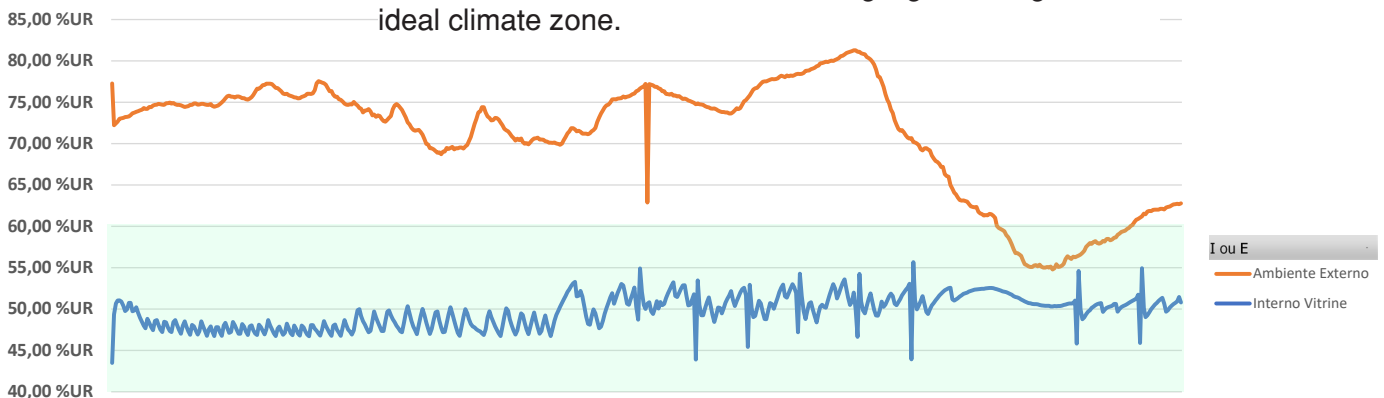
Always with the spirit of efficiency and transparency, customers can monitor the progress of the installation project, follow-up actions for operation, maintenance and especially all the data collection of temperature and humidity measurements over the period, through reports issued periodically.

E&B also has technicians for periodic maintenance, constantly seeking to meet the HVAC parameters with high standards. Our partner company is Hypocaustum, owned by the renowned HVAC Engineer Bruno Fedeli, specialized in Museums and Contemporary Art Reserves, with more than 10 years of experience in this type of HVAC system, which demands precision and responsibility in relation to the exhibited collection.

The visual project of the showcase can be developed together with our partner architect Helena Cavalheiro.



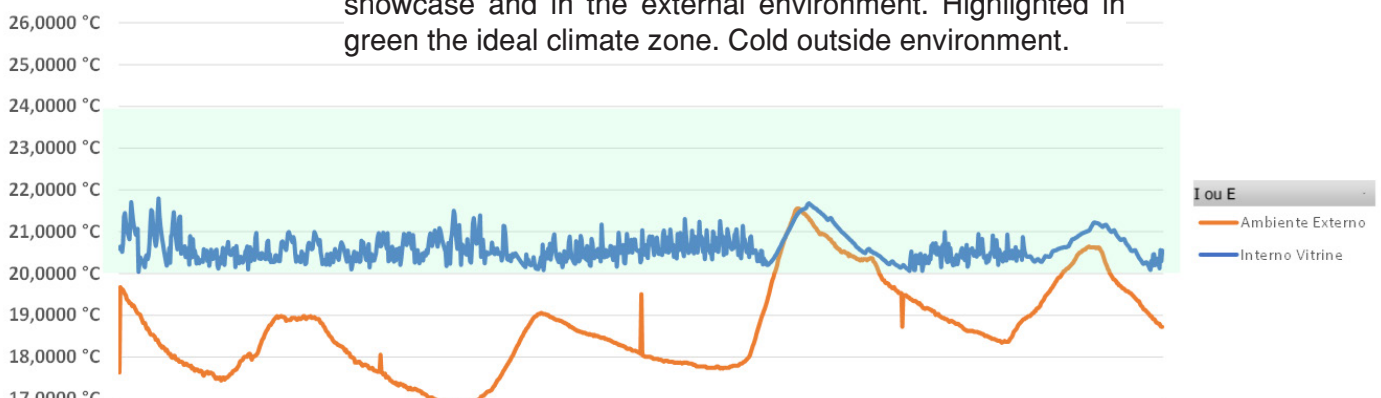
Graph 3 - Relative humidity parameters inside the showcase and in the external environment. Highlighted in green the ideal climate zone.



Blue line stands for the internal showcase air R.H.
Orange line stands for the air R.H. outside the showcase

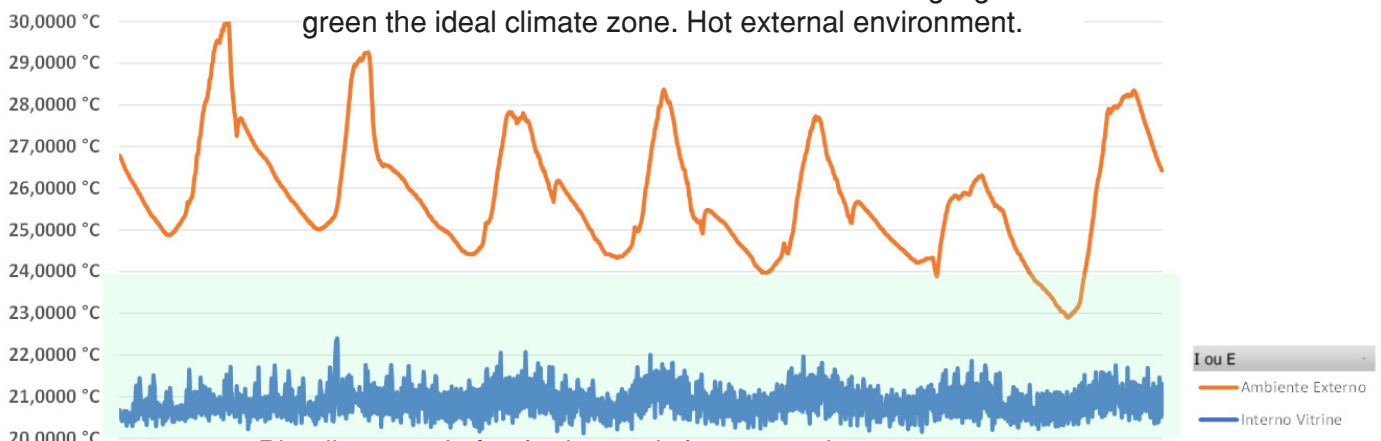
The active climate control showcase has the capacity of also working with the reverse cycle of heat pumping, functioning as a heating system without the installation of any electrical resistance, making it an ideal system for application in places where the cold environment of the external atmosphere can also be an issue. It can be observed in graphics 4 and 5 extreme situations where the internal stability of the showcase can be evidenced in relation to the variation of the external environmental climate.

Graph 4 - Dry bulb temperature parameters inside the showcase and in the external environment. Highlighted in green the ideal climate zone. Cold outside environment.



Blue line stands for the internal showcase air temperature
Orange line stands for the air temperature outside the showcase

Graph 5 - Dry Bulb Temperature parameters inside the showcase and in the external environment. Highlighted in green the ideal climate zone. Hot external environment.

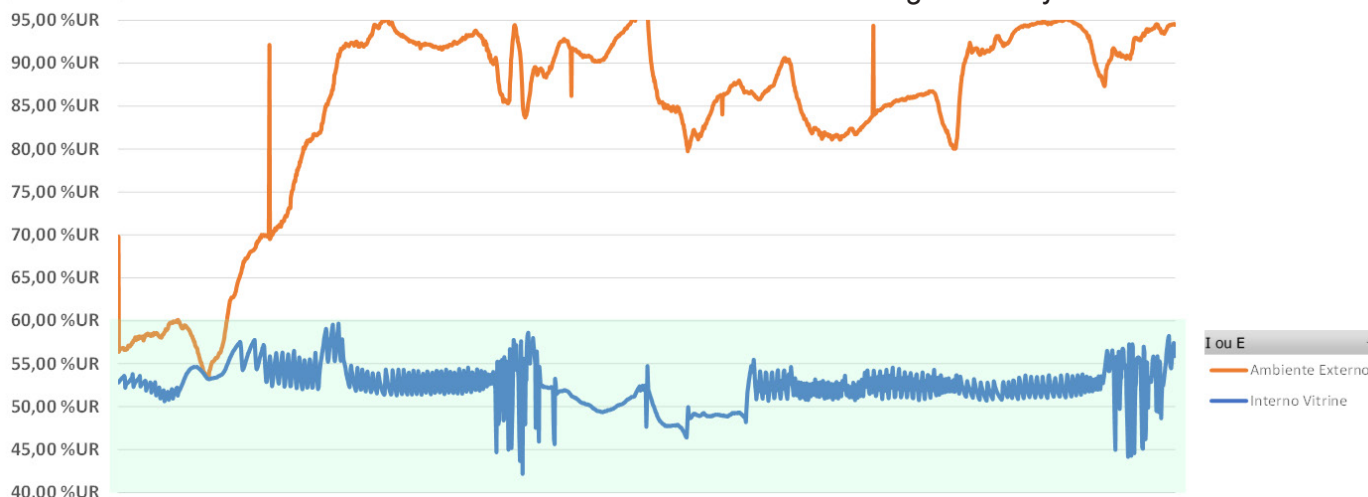


Blue line stands for the internal showcase air temperature
Orange line stands for the air temperature outside the showcase

We can observe that even with the significant variation in the external environment, we still observe stability in the internal atmosphere of the showcase.

The whole system also has mechanisms of reaction to the external environment with high relative humidity, it can be noticed at graphic 6 the operation of the showcase in surroundings that had magnitudes of relative humidity around 90.0% RH 5.0% RH. The humid external environment was not able to induce the internal HVAC to operate outside its operational zone.

Graph 6 - Relative humidity parameters inside the showcase and in the external environment. Highlight in green of the ideal climate zone. External environment with high humidity.



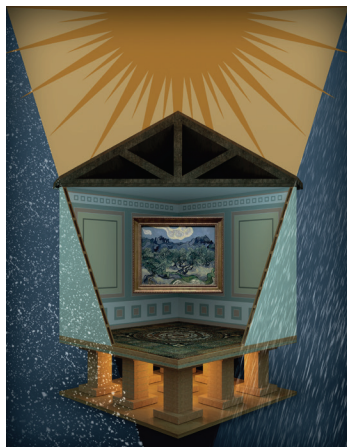
Blue line stands for the internal showcase air R.H.
Orange line stands for the air R.H. outside the showcase

The active climate-controlled showcase provides the possibility of exhibiting artworks at places previously not foreseen, or considered unsuitable, as it provides a climate stabilization capacity that is normally not possible to obtain at uncontrolled environments.



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Partnership:



HYPOCAUSTUM

Acclimatization for museums and museums reserves. Eng. Bruno Fedeli