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***LEADING-EDGE EQUIPMENT HOUSING***

***A peculiar interest for the scientific research in chemistry, physics, engineering, and the ideas drawn on the conversations with businessmen and researchers from different countries, have led me, since the seventies, to find suitable and innovative formulations of Shelter for telecommunication equipment and for the most different needs.***

*The following presentation provides the steps of this route, and the information on the bets that the Celantel is going to face in the future.*

A handwritten signature in purple ink, appearing to read 'Enzo Celant'.

**Enzo Celant**

## CELANTEL HISTORY



Celantel S.r.l. was established in 2000 by Enzo Celant as a continuation of a bet, which began more than forty years ago, focused in the field of the passive air conditioning of electronic equipment housings.

This continuous path enabled Celantel to face the most various problems introducing innovative and completely new solutions, as the passive cooling, in order to complete the most challenging projects arising in the market, starting from BAM project USSR (arctic shelter) and Ford Project Morocco (desert shelter).

The Company, with management and engineering offices in Vimercate (MB), can rely on a staff of 12 experts: ex-colleagues with proven ability and high competences. Whereas the manufacturing and testing activities are performed in two different sites: Parma for the actively and passively cooled shelter and Carnate (MB) for the racks and the metallic passive cabinets.

Celantel trusts, for its future, on the results of the research activities, engaging significant resources to the achievement of ambitious goals. All Celantel passively cooled products are patented. To date, Celantel has manufactured and supplied more than 1.000 shelter for the Middle East, Africa and Australia geographical areas.



# THE IDEA OF THE PASSIVE COOLING

Devices able to control the temperature without any energy consumption and maintenance.

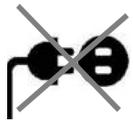


## The idea of the Passive Shelter - Reliability and Advantages

The idea for this invention arose, during the 70's, from the staff of Mr. Celant in Telettra, to face the necessity to provide the remote telecommunication stations of air conditioning systems that did not need any extra electrical power in addition to the one assigned to the equipment.

This brought to the development and the realization of devices, integrated to the shelter, able to transfer outside the heat generated inside the equipment housing, without energy consumption and maintenance, granting and increasing of the whole reliability.

Following this trail, Celantec has developed and implemented projects that allowed to increase their performances and their ease use, with a consequent impact on the costs and the application fields range



No energy consumption, necessary for the air conditioning, (or highly reduced).



Considerable increase of the global reliability due to the absence of mechanical moving parts and fluids under pressure. No maintenance required thanks to the sealed and "elastic" hydraulic circuit, refills free.



The devices are housed in a room without direct air entrance and with a temperature control without sudden jumps.



Passive cooled cabinet



Passive cooled Shelter

# OPERATING CRITERIA

## The Thermal Diode and the Thermal Condenser

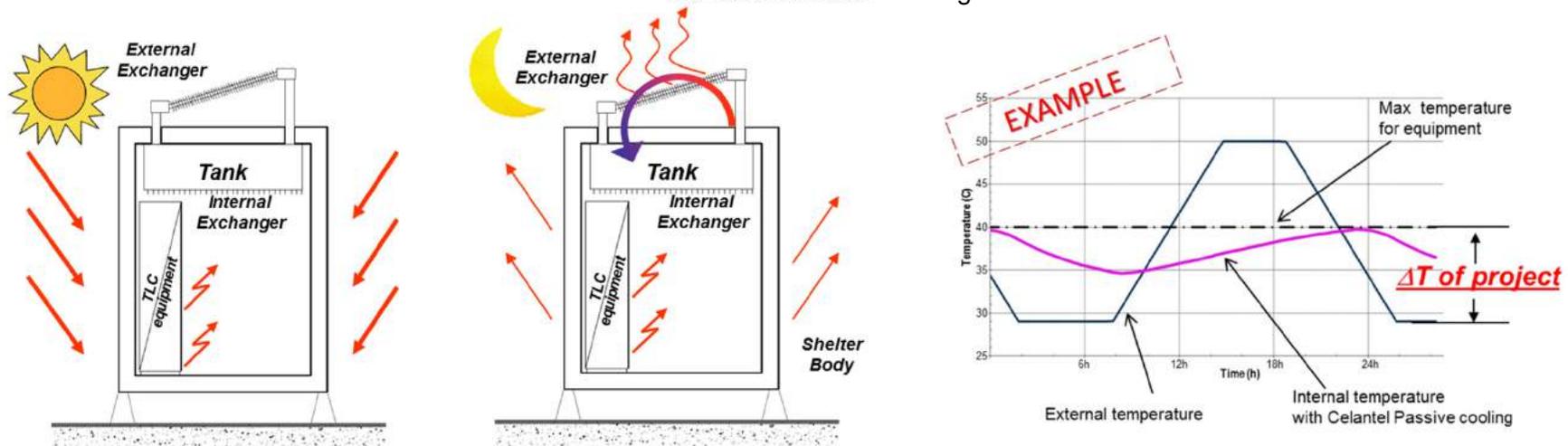


In order to make the air conditioning independent from any energy source, it is unavoidable to draw to the energy made available by the environmental climatic conditions. As a matter of fact the passive system employs the thermal energy available during the night, moving and collecting it inside and releasing it during 24 hours.

Celantel uses a patented device having two peculiarities: it is perfectly sealed so that it doesn't need any refilling during the operational stage and it is modular type. A fluid is employed as thermal vector and store function.

Every passive shelter is divided into two stages:

- The tank/Internal heat exchanger.
- The external heat exchanger.



The **tank/internal heat exchanger** has the function to control the internal thermal energy and allows the expected heat absorption. In certain circumstances is integrated by adding specific products i.e. Phase Change Materials (PCM).

The **external heat exchanger** is configured in order to maximize the heat exchange through the conduction toward the environment and through the radiation toward the outer space, introducing in this way a nocturnal sub cooling effects.

The passively cooled shelter follows the operational procedures of a diode (thermal), allowing the internal heat transfer toward the external and not vice versa.

### DIURNAL PHASE

The heat generated by the internal systems, added up to the contribution due to the environmental stress, is accumulated in the tank through the internal tank/exchanger, warming in this way the liquid stored inside.

### NOCTURNAL PHASE

The fluid inside the external exchanger cools down, starting the circulation process in the closed circuit (natural convection), till its complete regeneration.

# TYPES AND APPLICATIONS - I

## PASSIVE SHELTER AND CABINET

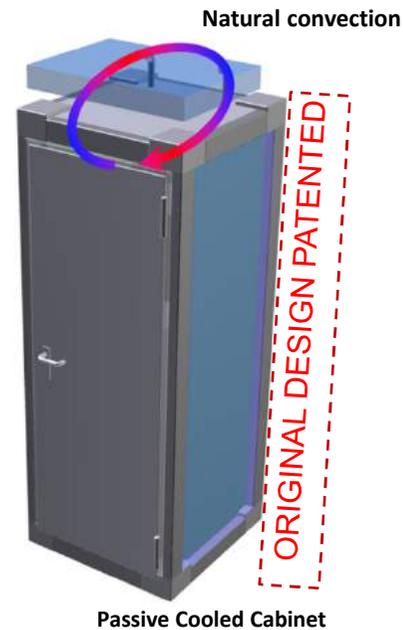
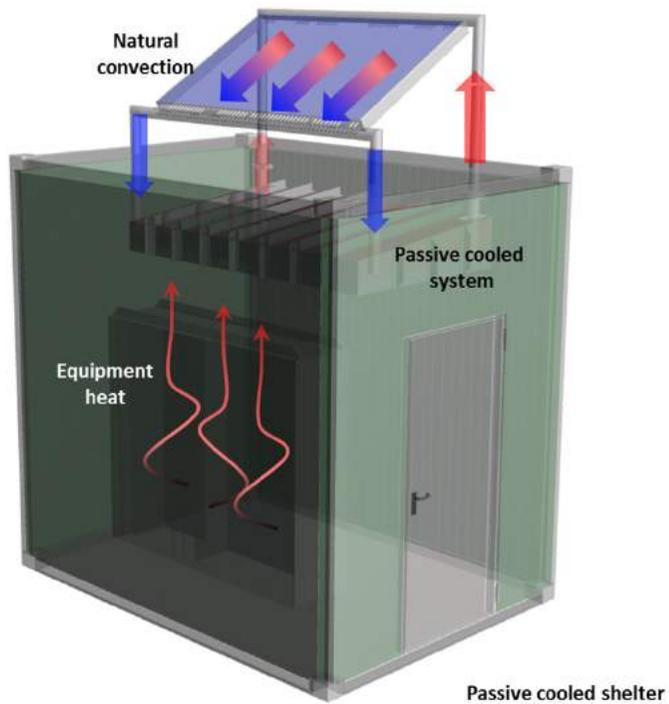


When the air conditioning does not depend on the energy supply - *ZERO ENERGY*

It is characterized by:

- Watertight internal room.
- Absence of moving mechanical parts.
- Absence of pressurized fluids.
- Hydraulic circuit perfectly sealed (watertight).

It concerns the remote stations or applications with no maintenance.



*Passive shelter with  
Fire fighting protection*



*PCS with solar and wind turbine*



*GRP Passive Cabinets*

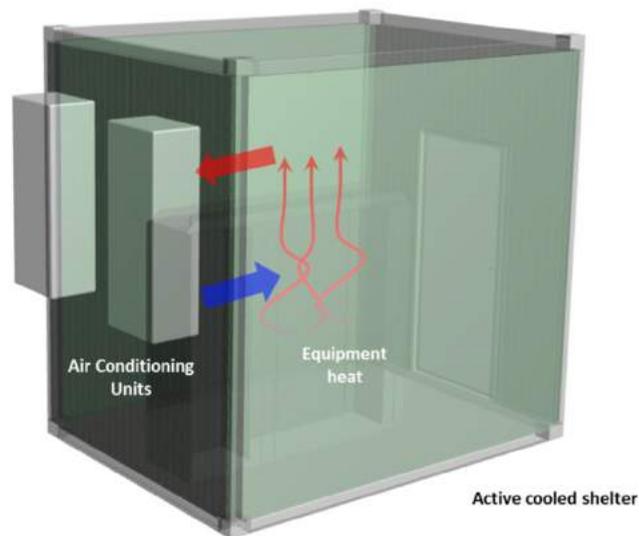
# TYPES AND APPLICATIONS - II

## ACTIVE SHELTER AND CABINET

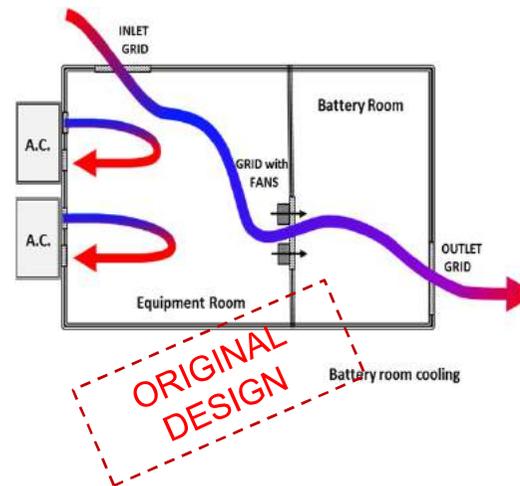


When the air conditioning uses electrically activated systems and/or devices allowing the air inlet / outlet. It is characterized by:

- Temperature control fully managed by an air conditioning.
- Ventilation with direct air input.
- It allows split units installation, integrated or roof type.



### Cooling Transfer Configuration



*CTC Shelter installation*



*Skid mounted  
GRP battery shelter*



*E1120 Fire Resistant*

**Manufactured with unframed composite panels shelter body (Fiberglass or Aluminum) or with framed container type steel structures.**

# TYPES AND APPLICATIONS - III

## SEMI-PASSIVE SHELTER AND CABINET

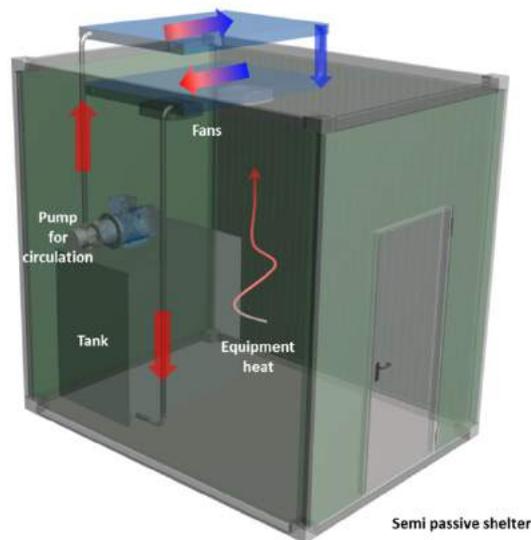


When the air conditioning is partially depending on the energy supply – *ENERGY SAVING*

The application is referring to high heat dissipation stations. It keeps all the characteristics of the passive shelter and it ensures a limited energy consumption and maintenance. There are three subcategories of product, suitable for fixed or mobile stations.

### High capacity Semipassive

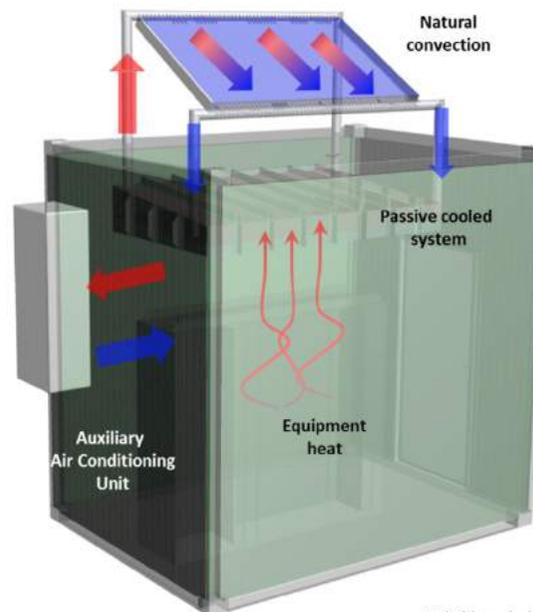
- This system is derived from the passive shelter with water circulation facilitated by a pump and internal or external forced ventilation to increase the heat exchange. It allows high heat dissipations maintaining, at the same time, the characteristics of low maintenance and consumption.



Semi passive shelter

### Hybrid

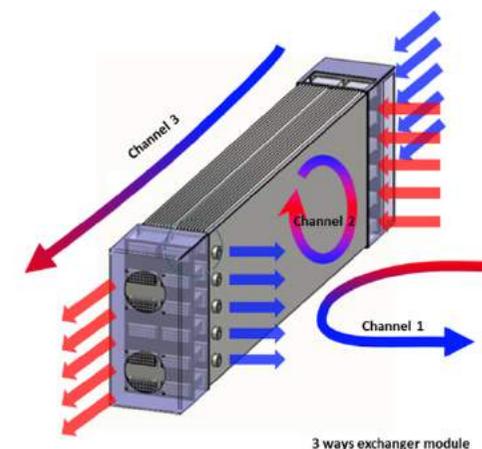
- Passive cooling system supported by an auxiliary air conditioner or chiller, which will be activated only during the warmer months of the year.



Hybrid cooled shelter

### Three ways Semipassive

- Made up of a three ways heat exchanger, it is equipped with storage and forced ventilation. It ensures a temperature control with low power consumption. This compact size module allows an optimization of the internal spaces of the shelter and the installation on existing shelter, already in field, to replace the traditional air conditioning.



3 ways exchanger module

# APPLICATION FIELDS



The use of these systems has no limits.

The Celantec's aim is to extend its use in applications so far managed with the traditional systems.

However the most common applications are in the following fields:

- Oil Gas On-shore and Off-Shore.
- Railways: stations for train control.
- Highways: stations for traffic control, visibility and other.
- RBS networks mobile stations.
- Radio-link, optical fiber stations.
- Electrical stations and substations and transformers housing.
- Climatic and environmental monitoring stations.
- Air traffic monitoring stations.
- Electronic housings for airports.
- Analysis cabins.
- Satellite stations.
- Broadcasting radio tv.
- Central archives.
- Rack Server.



# TECHNICAL SPECIFICATION I

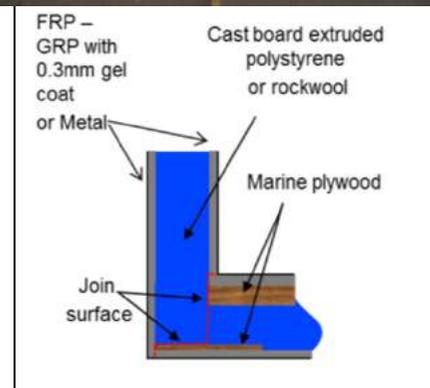
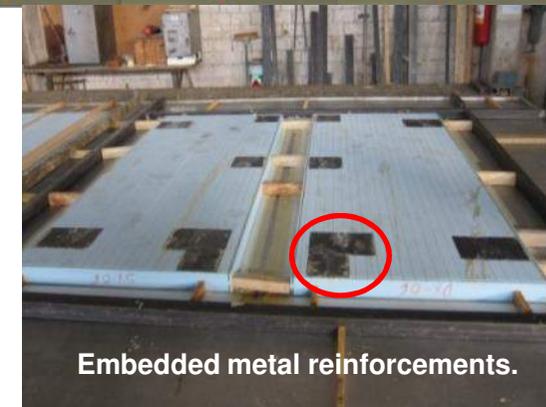
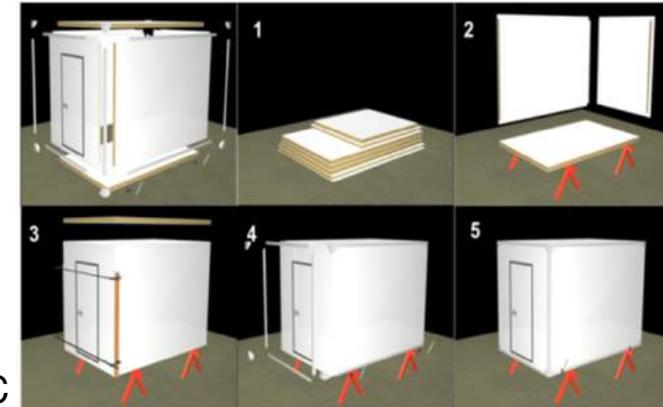
## PASSIVE SHELTER STRUCTURE



### EXCLUSIVE TECHNOLOGY

The Shelter Body is a monolithic structure without metal frame (no thermal bridges) made up of only six multilayer panels. Each one is composed of two claddings of Fibre Reinforced Polyester (FRP) and a core of extruded panels made of expanded polystyrene and created through a pressing process with thermal control.

- **COMPATIBILITY FOR HARSH (DESERT) ENVIROMENT**
  - Extended temperature range -50C to +85C
  - High scratches and dent resistance
- **HIGHLY ACCURATED THERMAL INSULATION VALUE**
  - Extruded polysterene
  - No metal frame
  - Single piece panels
- **HIGH EQUIPMENT PROTECTION**
  - Waterproof & Vapour tight panels
  - Overall IP65
- **HIGH STRUCTURAL RESISTANCE**
  - Advanced structural technology (Composite panel)
  - Self-supporting structure
  - Embedded metal reinforcements
  - Superior Floor & Roof load capacity
- **NO MAINTENANCE**
  - FRP claddings with embedded colour (no repaint needed)
  - No metal structural parts (no corrosion)
  - 30 years lifetime design



# TECHNICAL SPECIFICATION II

## INTERNAL FITTINGS



The Celantel engineering draws, sets up, and supplies the product, according to the project specification, complete with:

- Customized electrical system.
- Internal and external lights system .
- Distribution panel for services and/or customer devices.
- Continuous power supply system (UPS).
- Sealed cables passage and special wiring.

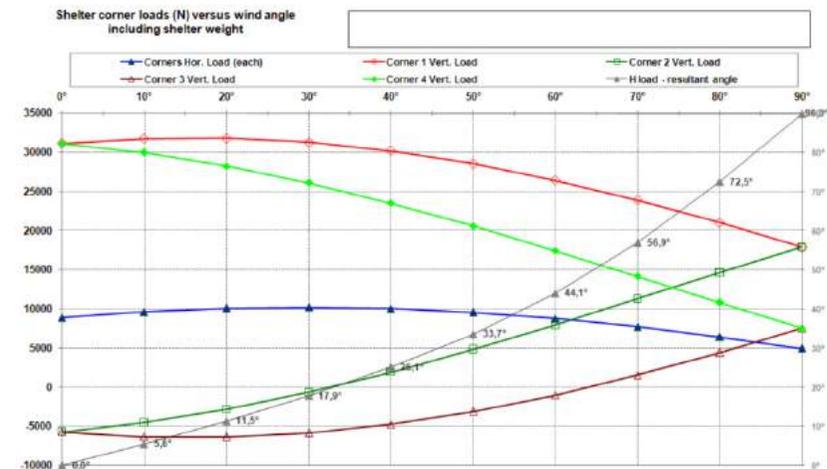
- Photovoltaic and Aeolian systems.
- Redundancies and ventilation management.
- Management logics development.

### Safety

- Smoke/fire detection system.
- H<sub>2</sub> or other explosive gas detection system.
- Monitoring and alarm recording systems (door, temperature, etc.)
- Active or passive air conditioning monitoring system.
- Alarm signals systems.
- Automatic fire extinguishing systems.

### Services

- Active or passive shelter thermal calculations.
- Structural calculations.
- Loads foundation calculations.
- Integrated formulations consultancy.
- Turnkey infrastructures supply.

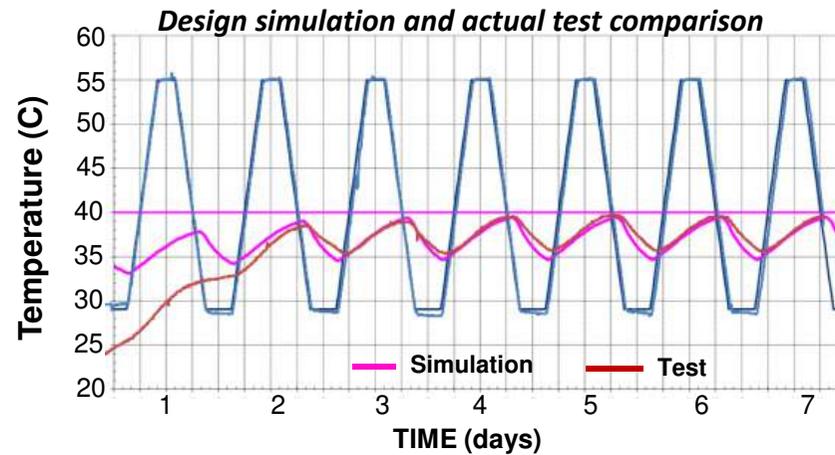


# FACTORY TESTS



## Climatic Tests

Carried out in a certified thermal chamber, it allows the right evaluation of the device (Cabinet or Shelter) thermal behavior when installed at the final destination site



## Mechanical Tests

- Floor load.
- Roof load.
- Wind resistance.
- Door resistance.
- Impermeability test.



## Electrical Tests

- Electrical system test.
- Accessories functionality check.
- Air conditioning tests .
- Wiring insulation tests.
- Insulating panel electrical resistance measurement .





*The biggest passive shelter in the world: ARAMCO RABIGH*



*Active shelter for NAVAIDS*



*Helicopter Transportable*



*Offshore Passive Cabinet*



*Modular Active Shelter*

# CERTIFICATIONS AND REFERENCES



## *Celantel is a ISO 9001 certified company*



Celantel has been working in over 100 international projects, collaborating with the most important telecommunication companies, oil & gas and with the major international contractors such as:

- ABB,
- ADCO,
- ARAMCO,
- BP,
- GASCO,
- TWIST,
- NESMA Trading Co,
- PETROFAC,
- BP&T,
- EMERSON,
- FUJITSU,
- CAT,
- TENESOL,
- SUNPOWER,
- SIEMENS,
- ENI-SAIPEM,
- SONATRACH,
- TOTAL,
- TSS4U,
- STA Ivory Coste,
- STC,
- LIBYANA,
- DESCON,
- SONATRACH,
- NEC,
- INEO,
- PDO,
- FRAMES,
- YANDALUX,
- NPCC,
- MADAF.TEL,
- SYS.CO,
- THALES,
- GENERAL DYNAMICS
- VASP Australia.



# FROM TRADITION TO INNOVATION IN THE SHELTERING PLANET



**MORE THAN 40 YEARS OF CONTINUOUS AND GROWING EFFORTS AND FULFILLMENTS IN THE EQUIPMENT HOUSING FIELD ALLOWED CELANTEC TO GUARANTEE:**

**A product portfolio to satisfy any project requirement and application with Shelter and Cabinet .**

- **Passive, Semi-passive, Water-based, PCM-based, Active, Vented and Conductive, Framed Container Type**
- **Reinforced Fiberglass (FRP or GRP), Metallic, Overground & Underground, NavAid (frangible).**
- **Fire retardant , Fire resistant, ATEX, Soundproof, Pressurized.**
- **Battery housing.**
- **Different configurations of indoor and outdoor server rack (19", ventilated, etc.)**

**An integrated turnkey product (complete package) according to the customer specifications (MR) and contractual documentation.**

**Customer support in all the stages of the supply, from the technical inspection to the engineering design by means of detailed drawings in Autocad.**

**30'000 m<sup>2</sup> of manufacturing site, 15.000 m<sup>2</sup> indoor, with Climatic chamber for thermal tests up to +60 °C.**

**A continuous production process optimized to coop with the most demanding delivery requests.**

**Air conditioning Consultancy Service and custom prototypes development.**

**Installation and commissioning field assistance.**



**Ingegneria, Gestione della commessa e Sito produttivo  
Engineering,**

**From small cabinet to big shelter**

# Thank you.

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Celant.Tel srl  
Via Pellizzari 28  
20871 Vimercate (MB) – ITALY

Ph. +39 0396084217  
Fax +39 0396084213

[info@celantel.com](mailto:info@celantel.com)  
[www.celantel.com](http://www.celantel.com)