

## 1. VIROC PANEL 1.1 PRESENTATION 1.2 APPLICATION 1.3 THE COMPANY 1.4 THE CEMENT WOOD PANEL 1.5 ADVANTAGES 2. THE PRODUCT 2.1 VIROC GREY 2.2 VIROC BLACK 2.3 VIROC WHITE 2.4 VIROC COLOURS 2.5 VIROC DETAILS 2.6 TECHNICAL SPECIFICATIONS 3. PRODUCTION 3.1 MANUFACTURING PROCESS 3.2 QUALITY 3.3 HIGENE AND SAFETY 4. FINISHINGS 4.1 MACHINING 4.2 COATINGS 4.3 JOINTS 4.4 FIXING 5. APPLICATION 5.1 FAÇADES 5.2 WALLS 5.3 FLOORS 5.4 CEILINGS 5.5 ROOF STRUCTURES 5.6 LOST FORMWORK 5.7 VIROCLIN SYSTEM

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- 1. Façade Civic Center Zaragoza, Spain

  2. "Ville B" House

  Marselha, France
- 3. Exterior ceiling School
- Zaragoça, Spain

  4. Façade Kidergarten
  Cacem, Portugal 5. Interiors - Restaurant
- 6. Interiors Casa "Decor" Madrid, Spain

# 1.1 viroc panel PRESENTATION

VIROC® is a composite material with flat surfaces constituted by a compressed and dry mixture of wood particles and Portland cement. This process results of a technological solution in the form of panels that respond to the present design and esthetic demands in the construction and architecture areas.

VIROC® is a versatile, functional and esthetic. It responds to various needs from now-a-days such as technical, functional and sustainable as it also has a wide range of esthetic finishings with a great possibility of satisfying a contemporary and innovative design.

The combination of the resistance and flexibility of the wood with the durability and strength of the cement, allow a large range of applications, both indoor as in indoor, as it guarantees a high resistance to fire, humidity, climate variations, noise, fungus, as it also has a great durability. On the other hand, the technical characteristics make the VIROC® solution affordable and easy to install, opening new opportunities to innovation in architecture and design.

# 1.2 viroc panel APPLICATIONS

The excellent characteristics of the VIROC® panel make suitable whenever there is the demand of high standards of durability, safety, comfort and affordability. Being a composite material constituted basically by two main construction materials, cement and wood, which guarantees technical ns physical characteristics, which were already referred to, allowing a large range of competitive applications. The range of use of VIROC® panels is so wide that includes various areas of application:

- Coating and insulation of facades
- Construction of walls (indoor or outdoor)
- Flooring (indoor or outdoor)
- Ceilings (indoor or outdoor)
- Roof structures
- Interior Design
- Lost Formwork and other multiplicity of uses in construction
- Sound barriers
- Urban Equipment

VIROC® is the first choice for applications in public and domestic buildings due to its resistance to impact, reaction to fire and acoustic resistance. Due to their extraordinary properties, VIROC® can be used in structural functions or coating using wood or steel structures. It can be used in big panels due to its resistance as individual panels. In both cases, the VIROC® structures are light, resistant to fire and acoustic barriers. These properties make VIROC® easy to install and they contribute to savings in the works. The VIROC® panels are applied in the metallic structures through auto-perforating screws, or in the case of wood structures, with screws, nails or staples. The application of a water repellent primer is recommended in the 6 faces of the panel for external applications. A wide range of paints, ceramic and other coatings can be used, but always having under consideration the compatibilities and what is recommended by VIROC®.

# viroc panel.1











#### IMAGES

Business Centre, Lisbon Technological Campus Lisbon. Portugal

2. Television Studios
Porto, Portugal

3. Library of the University of Coimbra

4. Portuguese National Guard Headquarter

5. Restaurant, Molhe da Pontinha Funchal, Portugal

# 1.3 viroc panel THE COMPANY

VIROC PORTUGAL - Indústrias de Madeira e Cimento S.A was constituted in 1992 and its goal is to produce panels of wood and cement. Since its creation in Portugal, VIROC® has come to consolidate its position the Portuguese Market, although a great part of its production is to exportation, around 75%. The excellent quality of the product associated to the technical and esthetic characteristics of the VIROC® panel allows the company to gain a solid position in demanding markets such as the USA, United Kingdom, France, Spain, and others.

VIROC Portugal is positioned in such ways that assures creation of value to its stock holders, clients, suppliers, employees, development and knowledge centers and society, as the unique way to quarantee sustainability and development.

The continuous development of new products and new solutions is fundamental to face a market that is continuously becoming more competitive with a great change dynamic and, for that reason, to make available to clients better products and solutions. Guarantee the complete satisfaction of our clients is one of the reasons that made us develop this Technical Manual that has as goal to allow clients and users to optimize the application of the panels getting advantage of its technical and esthetic characteristics. The objective is that this Manual contributes to architectural solutions with great energetic and environmental efficiency, contributing to the construction of homes, services and industry which guarantee the best comfort.

#### VISION:

VIROC® is an innovative partner, in search of excellency, creating ideas and value, turning into a global reference in the market of cement-wood panels.

#### MISSION:

To assure the complete satisfaction of stock holders, clients, suppliers and employees, supplying products and solutions in agreement with the tendency of the market guaranteeing the highest standards of quality to our clients and partners, paying back stock holders and employees, building a team oriented to the business and to the society,

#### VALUES:

**VIROC Portugal** is committed to accomplish, in its relationship with all stock holders, the ethical norms as well as maintaining the social and environmental commitment with the community, which belongs to.

## warranty

The VIROC® panel has a warranty for a 5 year period from the date of purchase as it will not crack, split or degrade. The warranty is not transferable and applies only if VIROC® is stored and installed according to the VIROC Portugal S.A. instructions. VIROC Portugal reserves the right to indemnify the client by replacing material or crediting back to the client the full purchase value of the material.

# viroc panel.1







#### IAGES:

Elementary School
 Landim, Portugal
 Library of the University of Coimbra
 Coimbra. Portugal

3. Public Health Centre Massamá, Portugal

# 1.4 viroc panel THE CEMENT WOOD PANEL

Born of the most used materials construction by men, cement composite panels with wood fibers gained a gradual importance in the world of construction, from the second half of the 20th century, due to the good results of rigidity, durability and isolation, as well as its versatile and wide application in construction. These factors have rallied this material to a more comfortable, more functional and mainly f aster to build constructions. The subsequent exploitation came to create a broad field of purposes in finishings that opened new doors into the world of architecture for a collection of contemporary and modern solutions associated to a material with unlimited finishing possibilities. The demands of today's markets, are related to resistance and comfort characteristics has they have already been mentioned, as well as cost factors associated with ecological issues in which the VIROC® panel is

All these factors make VIROC® panel, a suitable and modern panel for a new

# .5 viroc panel ADVANTAGES

VIROC® products are proud to be at the level of the highest requirements in the various fields of construction. Describing some of the major advantages in using the VIROC® panel and which benefits it ensures.

#### **ECOLOGICAL**

The VIROC® panel is environment friendly since it is not toxic and does not present any danger to public health. It does not contain nor liberates dangerous volatile compounds and they contain no silica, asbestos and formaldehyde. Are resistant to oil and petrol/gasoline.

#### **FIRE RESISTANT**

The VIROC® panel is incombustible and fire resistant preventing its spreading. It is in agreement with all the tests and certificates presented in this manual.

Class: B - s1 - d0 EN 634-1 e EN 13501-1 M1 NF P 92 501 / ASTM E136-04 Class 0 BS 476: PART 7

#### **HUMIDITY RESISTANT**

The VIROC® panel is an excellent choice in matters of moisture. Under the action of water does not disaggregate maintaining its aspect. It is a material which is impermeable to water being simultaneously resistant to water vapour.

#### **ACOUSTIC PERFORMANCE**

The VIROC® panel has excellent proven results compared to sound reduction and absorption factors, and is thus a good choice considering its acoustic performance. Noise reduction index varies depending on the thickness of the panel with an air sounds resistance of 31 to 37 db.

The sound absorption coefficient is  $\alpha = 0.10$  to frequencies form 250 Hz to 500 Hz.

# viroc panel.1

#### **RESISTANT TO COLD**

**RESISTANT TO IMPACT** 

DURABILITY

guaranteeing a good outcome of rigidity.

**DIMENSIONAL STABILITY** 

relative to air humidity of 0.5%.

its maintenance over time.

**EASILY WORKABLE AND APPLIABLE** 

requirements of modern construction.

COMPETITIVE COSTS

cost competitiveness.

The VIROC® panel was tested in different environments and climates in order to ensure a good resistance to the most adverse cold and hot temperatures. Used as an isolator and due to its characteristics, thermal performances are notable in any

The structural integrity of the panel makes it resistant to impact, combining the

rigidity of wood with the durability and the qualities of hardness of the cement. The mixing of two materials is highly compressed and dry during a long period,

The nature, quality, and exceptional durability properties recognized in cement, and the process of mineralization of wood particles, guaranteed that the VIROC® panel provides good results in durability issues, as evidenced by the BRE test.

Maximum longitudinal and transverse variation between extreme amplitudes

**RESISTANT TO FUNGUS, INSECTS AND MICRO ORGANISMS** The VIROC® panel does not degrade with this action of living organisms as

termites, fungus, or any type of insects, as well as resists to moss and all

vegetation, due to the resistance of its cement component, a factor which ensures

The VIROC® panel can be processed with any wood treatment tool regarding the finishings. The boards can be cut, pierced and sanded. Its easy application, with

different systems, allows meeting the conditions required by the technical

It's easy implementation and it's the various fixation systems, ensures a

competitive cost as constructive or coating solution, associated with quality and

industrial production process, integrating itself in all budgets. The longevity and the

inalterability of the VIROC® panel, minimizes its maintenance, contributing also to

Variation of thickness after immersion in water for 24 hours of 1.5%.



























# 2.1 product VIROC GREY

VIROC® GREY is the title presented to the panel produced in the natural color of cement. It has smooth and flat surfaces and may have the following finishings:

BRUT - BRUT:

- Panel with both surfaces flat and smooth in its natural grey color.

**BRUT - SANDED:** 

- Panel with one plain and flat grey and with the other surface sanded.

- Panel with both surfaces sanded (wood particles to sight).

SANDED WITH PRIMER:

- Panel with both surfaces sanded, with the application of a sealer.

## dimensions

3000 x 1250 mm 2600 x 1250 mm

Thickness BRUT - BRUT: 8, 10, 12, 16, 19, 22, 25, 28, 32 mm Thickness SANDED - BRUT: 8, 10, 14, 17, 20, 23, 26, 30 mm Thickness SANDED - SANDED: 8, 12, 15, 18, 21, 24, 28, 32 mm Other measurement under requested.

# OUTDOOR

The VIROC® panel adapts easily to any external application. Has greater potential for use in façades, since it enables different and varied finishings, treatments or aspects considering the final purpose. It is important to take into account the final coatings to apply on the panel for each external situation so that it can enjoy the best of its potential defenses against agents of nature.

Apart from recognized use in façades, the VIROC® panel can be applied outdoors also in flooring, false ceilings, partitions, lost formwork and diverse urban equipment.



1. Polido Valente Hospital Lisboa, Portugal 2. "Ville B" House

Marselha, France 3. Public Health Centre Massamá, Portugal

Zaragoca, Spain









1. "Casa Decor" Madrid, Espanha 2. "Casa Decor" Porto, Portugal 3. Library of the University of Coimbra Coimbra, Portugal 4. Museu de la Ciencia (Science Museum)

5. City Hall Pools of Lepe

The VIROC $^{\circ}$  panel has several applications in various indoor environments. Its recognized capacities concerning acoustic performance, humidity, reaction to fire and resistance, makes it a right and innovative choice in terms of indoor applications. It's a robust, versatile material that allows various finishings and coatings which can be allied to modern, innovative and easily applicable interior

The VIROC® panel is suitable for indoor applications both in public buildings of great affluence of people as well as in housing or services buildings. It is also indicated for humid indoor spaces, spaces that have a great degradation and areas of strong noise emissions.

Indoors, the VIROC® panel can be applied on floors, ceilings, linings and wall insulation, partitions and can also be used in design and furniture mobile or fixed.

For each of the applications, VIROC® recommends the best technical solutions for your best performance





# applications INDOOR









VIROC\_2 | 3

product .2

# 2.2 product VIROC BLACK

**VIROC**<sup>®</sup> **BLACK** is the title presented to the panel manufactured with a black shade. It has smooth and flat surfaces and may have the following finishings:

#### BRUT:

- Panel with both surfaces flat and black panel.

#### SANDED:

- Panel with both surfaces sanded, with darkened wood particles to sight.

## dimensions

3000 x 1250 mm 2600 x 1250 mm

Thickness BRUT: 8, 10, 12, 16, 19, 22, 25, 28, 32 mm. Thickness SANDED: 8, 12, 15, 18, 21, 24, 28, 32 mm. Other measurement under requested.

# applications OUTDOOR | INDOOR

The VIROC® BLACK panel has the same fields of application as the VIROC® grey, having the added value of its appearance. It will then be chosen by the esthetic and decorative characteristics. It is indicated for use in façades, floors, ceilings and partition walls, as well as in interior design.

It is important to take into account the final coatings to apply on the panel for each situation outdoor for it to respond in a better way regarding inalterability and durability, as well as indoor to ensure the desired look.

#### IMAGES:

1 and 2. Home in Quinta da Marinha Cascais, Portugal 3. Kindergarden, Cacém Cacém, Portugal 4 and 5. Outdoor - Molhe da Pontinha Funchal, Portugal 6. Indoor - Molhe da Pontinha Funchal, Portugal





# product .2









product.2

# 2.3 product VIROC WHITE

The VIROC® WHITE is the name given to the panel manufactured with white cement. The mixture of white cement with natural color pine wood gives rise to a creamy-white shade. The surfaces are smooth and flat, and the pane I provided only with natural surface finishing "brut". With this original tone, the VIROC® panel extends its range of esthetic options along with the requirements of architecture. It displays the same performance characteristics as the VIROC® GREY.

## dimensions

3000 x 1250 mm 2600 x 1250 mm Thickness: 10, 12, 16 mm Other measurements under requested.

# applications VIROC WHITE

The VIROC® WHITE panel is indicated for outdoor and indoor use, such as façades, walls, ceilings, floors, roofs, interior design and lost formwork. It is important to take into account the final applying coatings on the panel for each situation in the outdoor so it responds in the best way possible to inalterability and durability issues, as well as indoor so that it guarantees the final aspect that is wanted.



#### IMAGES:

1; 2; 4; Hotel La Bastidone Marseille, France 3. Familiar House







PRODUC

# **VIROC COLOURS**

With its known versatility and compatibility with various coatings, the VIROC® panel allows a wide variety of finishings in its final visual appearance, and it can be painted with outdoor paint suitable for cement based or concrete based,

placed on a previously applied primer layer on the board.

The paint and the number of layers to be applied should always be recommended by Viroc Portugal to ensure the quality of the desired finishing.













Housing Building
 La Coruña, Espanha

2. Civic Swimming pools Esmoriz, Portugal

Children's Occupation Centre
 Alverca, Portugal
 Exhibition Pavillions

Torres Vedras, Portugal

5. Soria Hospital Soria, Espanha

# 2.5 product VIROC DETAILS

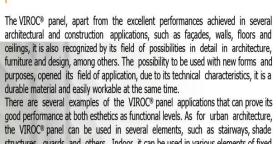
 Guard in housing building.
 Lisboa, Portugal 2. Outdoor stairway for uni familiar ho Cascais, Portugal 3. Shading structure. Madeira, Portugal. 4. Shading/ Roof Structure Costa da Caparica, Portugal.

5. Bellow Shutters, University Residence Açores, Portugal. 6. Bar counter of Football Stadium Covilha's City Hall Stadium, Portugal.

structures, guards and others. Indoor it can be used in various elements of fixed furniture as in cabinets, benches and partitions or any other type of decorative furniture. In summary it is a material that does not have limits on its uses and in the esthetic field of design.



















2 | 11

# 2.6 product TECHNICAL SPECIFICATIONS composition of the product

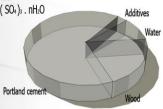
The components of VIROC® panel are:

#### **VIROC® GREY**

- Portland Cement CEM II / A-L 42,5R 66,7%
- Particles of peeled wood (pine tree) 20,7%
- Water 10,7%

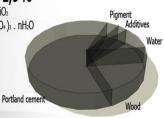
RODUCT

- Other non toxic compounds 1,9%
  - Sodium silicate Na<sub>2</sub>O . nSiO<sub>2</sub>
  - Aluminium sulphate Al<sub>2</sub> ( SO<sub>4</sub> )<sub>3</sub> . nH<sub>2</sub>O



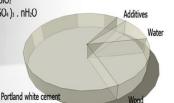
#### **VIROC® BLACK**

- Portland Cement CEM II / A-L 42,5R 62,9%
- Particles of peeled wood (pine tree) 20,7%
- Water 10,7%
- Other non toxic compounds 1,9%
  - Sodium silicate Na<sub>2</sub>O , nSiO<sub>2</sub>
- Aluminum sulfate Al<sub>2</sub> (SO<sub>4</sub>)<sub>3</sub> . nH<sub>2</sub>O
- Black pigment 3,8%



#### **VIROC® WHITE**

- Portland White Cement CEM II / A-L 52,5N 66,7%
- Particles of peeled wood (pine tree) 20,7%
- Water 10,7%
- Other non toxic compounds 1,9%
  - Sodium silicate Na<sub>2</sub>O . nSiO<sub>2</sub>
  - Aluminum sulfate Al<sub>2</sub> (SO<sub>4</sub>)<sub>3</sub> . nH<sub>2</sub>O



#### features

DENSITY: 1350 kg/m<sup>3</sup>

#### MOISTURE CONTENT AT DISPATCH FROM THE MANUFACTURER:

9 - 12% (average)

**SUPERFICALL ALKALINITY:** pH = 11 - 13

THERMAL CONDUCTIVITY: k = 0,23

**MODULUS OF ELASTICITY IN BENDING: 6000 MPa** 

#### CHARACTERISTIC BREAKING STRENGHT [MPa]:

Parallel Traction to the surface	5,00 MPa
Perpendicular Traction to the surface	0,60 MPa
Traction by bending strength	10,5 MPa
Parallel compression to the surface	15,0 MPa
Perpendicular compression to the surface	40,0 MPa
Shear strength	2,00 MPa

#### FACTOR OF RESISTANCE TO WATER VAPOUR PERMEABILITY:

 $\mu = 30$  EN12986 (Humid method).

 $\mu = 50$  EN13986 (Dry method).

#### **REACTION TO FIRE:**

Thickness less than 16 mm = 0,6 mm/min. Thickness larger or equal to 16 mm = 0,5 mm/min

#### B - s1 - d0 Rule EN 634-1 e EN 13501-1

s1 - SMOGRA (Smoke grouth rate) ≤ 30m²/s² TSP600s (total production of smoke) ≤ 50m². d0 - After 600 seconds, there is no release of incandescent particles.

M1 NF P 92 - 501 Class 0 BS 476:PART 7

#### tolerance

WIDTH AND LENGHT: +/-3 mm **EDGE STRAIGHTNESS:** < 1.5 mm **SQUARENESS:** < 0,2%

#### THIKNESS:

BRUT		BRUT / SANDED		SANDED
8, 10:	± 0,7 mm	8,10:	± 0,7 mm	8 to 32: ± 0,3 mm
12:	± 1,0 mm	14:	± 0,8 mm	
16:	± 1,2 mm	17, 20, 23, 26, 30:	± 1,0 mm	
19, 22, 25, 28, 32:	± 1,5 mm			

#### **ACOUSTICAL PROPERTIES**

#### Airborne sound insulation rate of the panel:

08 mm	Rw = 31 (-1;-3) dB	
10 mm	Rw = 32 (-2;-3) dB	
12 mm	Rw = 33 (-1;-3) dB	
16 mm	Rw = 35 (-2;-3) dB	
19 mm	Rw = 35 (-1;-2) dB	
22 mm	Rw = 37 (-2;-3) dB	

#### Coefficient of sound absorption:

 $\alpha$  = 0,10 for frequencies from 250 Hz to 500 Hz

#### **WEIGTH OF THE PRODUCT**

Thickness [mm]	Dimensions [mm]	Weight [kg/unit]	Weight [kg/m²]	
8	2600 x 1250	35	10,8	
0	3000 x 1250	41	1010	
10	2600 x 1250	44	13,5	
10	3000 x 1250	51	10,0	
12	2600 x 1250	53	16,2	
12	3000 x 1250	61	10,2	
16	2600 x 1250	70	21,6	
10	3000 x 1250	81	21,0	
19	2600 x 1250	83	25.7	
19	3000 x 1250	96	20,1	
22	2600 x 1250	97	29,7	
22	3000 x 1250	111	25,1	
25	2600 x 1250	110	33.8	
23	3000 x 1250	127	33,0	
28	2600 x 1250	123	37.8	
20	3000 x 1250	142	37,0	
32	2600 x 1250	140	43,2	
32	3000 x 1250	162	73,2	

#### **DIMENSIONAL STABILITY**

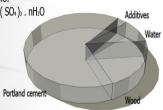
Longitudinal and transversal variation between external amplitude and the relative humidity of the air: 0.5% Thickness variation after 24 hour water immersion: 1.5%

# 2.6 product TECHNICAL SPECIFICATIONS composition of the product

The components of VIROC® panel are:

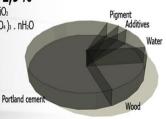
#### **VIROC® GREY**

- Portland Cement CEM II / A-L 42,5R 66,7%
- Particles of peeled wood (pine tree) 20,7%
- Water 10,7%
- Other non toxic compounds 1,9%
  - Sodium silicate Na<sub>2</sub>O . nSiO<sub>2</sub>
  - Aluminium sulphate Al<sub>2</sub> ( SO<sub>4</sub> )<sub>3</sub> . nH<sub>2</sub>O



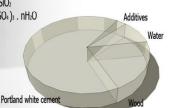
#### **VIROC® BLACK**

- Portland Cement CEM II / A-L 42,5R 62,9%
- Particles of peeled wood (pine tree) 20,7%
- Water 10,7%
- Other non toxic compounds 1,9%
  - Sodium silicate Na<sub>2</sub>O . nSiO<sub>2</sub>
  - Aluminum sulfate Al<sub>2</sub> ( SO<sub>4</sub> )<sub>3</sub> . nH<sub>2</sub>O
- Black pigment 3,8%



#### VIROC® WHITE

- Portland White Cement CEM II / A-L 52,5N 66,7%
- Particles of peeled wood (pine tree) 20,7%
- Water 10,7%
- Other non toxic compounds 1,9%
  - Sodium silicate Na<sub>2</sub>O . nSiO<sub>2</sub>
  - Aluminum sulfate Al<sub>2</sub> ( SO<sub>4</sub> )<sub>3</sub> . nH<sub>2</sub>O



# product.2

#### features

DENSITY: 1350 kg/m<sup>3</sup>

#### MOISTURE CONTENT AT DISPATCH FROM THE MANUFACTURER:

9 - 12% (average)

**SUPERFICAIL ALKALINITY:** pH = 11 - 13

THERMAL CONDUCTIVITY: k = 0,23

**MODULUS OF ELASTICITY IN BENDING: 6000 MPa** 

#### CHARACTERISTIC BREAKING STRENGHT [MPa]:

Parallel Traction to the surface	5,00 MPa
Perpendicular Traction to the surface	0,60 MPa
Traction by bending strength	10,5 MPa
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#### B - s1 - d0 Rule EN 634-1 e EN 13501-1

**s1** - SMOGRA (Smoke grouth rate)  $\leq 30\text{m}^2/\text{s}^2$ TSP600s (total production of smoke)  $\leq 50\text{m}^2$ .

d0 - After 600 seconds, there is no release of incandescent particles.

M1 NF P 92 - 501 Class 1 BS 476:PART 7

#### tolerance

WIDTH AND LENGHT: +/-3 mm EDGE STRAIGHTNESS: < 1,5 mm SQUARENESS: < 0,2%

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19, 22, 25, 28, 32:	± 1,5 mm			

#### **ACOUSTICAL PROPERTIES**

#### Airborne sound insulation rate of the panel:

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#### Coefficient of sound absorption:

 $\alpha$  = 0,10 for frequencies from 250 Hz to 500 Hz

#### WEIGTH OF THE PRODUCT

Thickness [mm]	Dimensions [mm]	Weight [kg/unit]	Weight [kg/m²]
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20	3000 x 1250	142	01,0
32	2600 x 1250	140	43.2
32	3000 x 1250	162	70,2

#### **DIMENSIONAL STABILITY**

Longitudinal and transversal variation between external amplitude and the relative humidity of the air: 0.5% Thickness variation after 24 hour water immersion: 1.5%

RODUCT

# production .3

# 3.1 production MANUFACTURING PROCESS

The process begins by shelling of pine wood logs, reducing its size in chips. These chips will be refined and classified in large and fine chips.

In the mixer the dosage is made, the large chips, the additives and the water. Then it is determined the cement to constitute the mixture. All products are weighed in electronic scales.

The mixture entering the conformation phase which is distributed with a uniform thickness on steel boards forming a mattress. This mattress presents heterogeneous chips: on both sides find thinner chips and greater concentration of cement to confer to the boards a smooth and compact surface. It is formed a stack of alternating mattresses and boards with depending on the number of layers of thickness of the boards to manufacture. The stack is pressed in a staple which is introduced in hardening oven, where under the effect of pressure, temperature and againg acquires resistance needed to be handled.

The staple is decompressed and separate boards. The VIROC® boards suffer a pre-cut operation and are again stacked and left to mature. After being mature the boards are introduced in a drying tunnel in order to take out the excess humidity.

At this stage the boards are finalized in terms of production, the quality control does rehearsals and tests to verify the characteristics of the produced panel. At last, the panel enters the finishing stage where it is superficially treated and cut, according to clients' requests.

## construtive raw materials

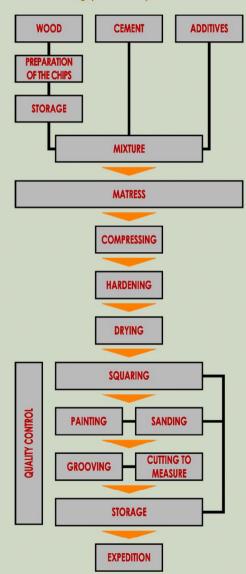
#### Portland Cement CEM II / A - L 42,5R:

This cement is a product of great versatility, combining with a good workability and high resistance, with a rapid development of same characteristic which allow its use in concrete of several classes of resistance and in slight or heavy pre-manufacturing.

#### Pine wood tree:

A the chips of wood used in the mixture of the VIROC® panel derive from the national wild pine tree (Pinus Pinaster Ait).

# manufacturing process plan









# production .3

# 3.2 production QUALITY

VIROC Portugal S. A. assumes the commitment to offer to its clients high quality products.

We know that it is fundamental to transmit to our customers the trust in the technical and organizational capability of our company. For this reason, all the collaborators of VIROC Portugal S. A. are conscious of the importance of the quality and its continuous improvement. Only with the engagement and the responsibility of all, it is possible to accomplish a work of quality.

In April of 2004, the VIROC® product obtained the authorization for the use of the CE mark, according to European standard EN 13986, of a recognized French laboratory. Since then the product has been recognized by this laboratory. Obtaining this mark was only possible because VIROC Portugal S. A. possesses a rigorous control of quality, accomplishing all of the standard requirements. The physical characteristics and the mechanical resistance demanded by the European standards are insured through daily tests in the laboratory of the company and all dimensional characteristics in the productive process are controlled.

VIROC Portugal S. A. will continue to optimize systematically its products ant its procedures, intending to offer its clients products that meet their demands and needs

## manufacture control

#### **CONTROLE IN THE MANUFACTURE PROCESS:**

- Humidity of the wood chips
- Size of the wood chips
- Thickness of the wood chips
- Density of the additives
- Sugar and Tannin rate
- Mixture humidity
- Height of the mattress

#### PRODUT CONTROL:

- The density
- bending strength
- Humidity
- Swelling after 24 hours immerse in water
- Perpendicular traction to the surface
- Cyclic rehearsals of swelling and traction
- Thickness
- The visual aspect

# certificates of VIROC panel

#### BRE

The BRE laboratory, made a specific research for the VIROC® panel, in order to assess the effect of ageing in strength, rigidity, mass and dimensions of the panel, in prolonged exposure. This study was developed initially in 6 months but subsequently extended for 1 year.

The results show a much better performance than necessary in the EN standards. The strength and rigidity of the panel were consistently increasing exposure time during the trial period for 48 months. This indicates that there is a high potential to project more products in the factory, as products of lower density, thinner panels or with increased proportion of particles. Environmental exposure conditions can have large effects on the behavior of the Panel, which must be taken into account in the selection of the project pane, as its application and finishing.

- -VIROC® Panel mass increases consistently.
- -VIROC® panel dimensions are falling consistently.
- -The strength and rigidity of the board increase consistently, at least in the early years after installation of the board.

#### ICC - EVALUATION SERVICE

ICC certification ensures for the VIROC® panel results in various application areas such as:

- -performance against fire
- -control of transmission of sound
- -thermal conductivity and resistance
- -outdoor coatings
- -structural performance

#### **UL** - UNDERWRITERS LABORATORIES

Underwriters Laboratories is a reliable organization for product safety certification, having already tested and set standards for security in many products in varied areas.

The VIROC® panel was tested in ceilings and floors systems for isolation of air sound and the isolation to the sound of impact.

#### **GREEN BUILDING**

GREEN building program is a voluntary program launched in 2005 by the European Commission. The program aims to raise awareness and encourage investment in energy efficiency projects and integration of renewable energy in non-residential buildings. On the other hand is ensured public recognition to all organizations that implement projects resulting in significant energy savings. These economies will be advantageous in energy and financial terms. VIROC® has stated its commitment to partnering with "Green Building" meeting their objectives for the same, having implemented a plan to reduce consumption of energy on the rehabilitation of their building.



0380 - CPD - 0601 VIROC PORTUGAL

VIROC PORTUGAL ndústrias de Madeira e Cimento S.

EN 13986

EN 634-2

Reacção ao fogo: B-s1-d0
on to fire. Réaction au feu, Reacción al

Reaction to fire, Réaction au feu, Reaccion al fueg Módulo de Elasticidade: Classe 1 Modulus of elasticity, Module d'élasticité, Médité de Elasticité.









# production .3

# 3.3 production HYGENE AND SAFETY

VIROC® panels are not toxic, they don't contain dangerous volatile compounds and they are exempted of silica, asbestos and formaldehyde. They don't present any dangers for the public health nor for the atmosphere, and they are incombustible.

However, due to their size and weight VIROC® panels can present some risks, namely in the handling and cutting. These risks can be easily controlled if simple rules are followed.

## risk control

#### Handling

Due to the size and weight, the VIROC® Panel, can carry some risk associated with its handling, particular risk of damage to skeletal muscle.

Measures should be taken in proper handling and taken whenever possible the use of mechanical handling tools, or inability to use manual tools support for handling and also equipment legs and higher. Some processes involve the use of any material, including:

- Rising hooks: they allow just one person to move panels of small dimensions. The hooks should have the extremities protected to prevent damaging the edges of the panel.
- Trolleys of panels: they allow a single worker to maneuver a significant amount of panels. The base of the trolley should be protected to prevent damaging the edges of the panel.

#### Machining:

When machining, VIROC® panels dust is freed that doesn't constitute a health risk, but it can cause irritations in the breathing system and in the eyes.

So, whenever possible, aspiration of dust equipment should be used. If such is not possible protection equipment should be used such as masks and glasses.





#### HANDLING

Whenever possible use suitable equipment for their mechanical handling this impossibility, use auxiliary equipment for your manual handling. Loose panels shall be transported in order to stay fully protected by plans and waterproof material. When the panels are moved manually, VIROC® must be transported in a vertical position. It should always be followed by the standards of hygiene and safety.

#### STORAGE

The VIROC® panels must be stored horizontally in flat areas supported in brackets. The supports should have sufficient height to be easily transported by a truck. They should be spaced between centers no more than 600 mm, supported at ends. If pallets of boards are placed on top of each other, each bracket should be aligned with the lower pallet to prevent deformation of boards. On the outside the VIROC® Panel should be protected with plastic sleeve.

#### TRANSPORT

The transportation of the product is not covered by regulations on the transport of dangerous substance. The conditioning of the product in the means of transport must ensure its stability. The panels during transport shall be protected by impermeable coverage. The edges of the boards should be protected so as to avoid damage caused by ropes, girdles, or other packaging system. The protection of the sides, corners or faces should be maintained until the panels are used.

#### CONDITIONING

 $VIROC^{\circ}$  panels have an ex-damp of 9% to 12% and are in balance when the temperature of 20 °c and a relative humidity of 60 to 80%. To ensure conditions for the application, the Panel should be adapted to the ambient humidity during 48 hours before being applied.

#### TOXIDITY

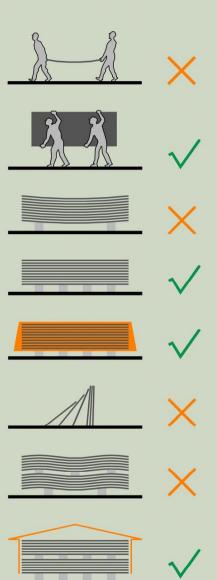
The material used is not toxic and non-toxic risks echo. Due to the release of dust when machining VIROC®, this board can be irritating to eyes and airways.

Reactivity: there is no condition or story to avoid, nor any hazardous decomposition product.

#### RESIDUES

Waste and excess boards shall be deposited in premises and authorized to that effect. The product is persistent degradability, biodegradable.

Code 101311



# 4.1 finishing MACHINING

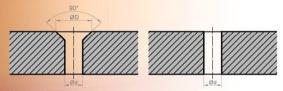
# cutting

One of the Great advantages of the VIROC® pane is that it can be worked as wood, so any wood tool can be used in this sense.

For jobs in VIROC® panels in which the thickness is until 19 mm, a portable circular saw can be used. For larger thicknesses or great volumes a workbench saw should be used because it allows a better surface quality and the hygiene and safety requirements are easy to apply. The teeth of the saw disk should be alternated or trapeze like, thin and with tungsten tab to cut wood. It is recommended that the board is unmovable when cutting in order to avoid vibrations and subsequent damages. The boards that have surface treatment already applied must be cut on the posterior side (untreated) so that the saw and the released dust don't damage the treated side. It is recommended that in any situation, the vacuuming of the dust release when cutting to protect the work environment. When cutting with a jigsaw wood blades should be used. When cutting the boards 5 mm in each side is used up.

## drilling

VIROC® can be drilled with a conventional high-speed brace in that the tip of the drill will be made of self-hardening (fast) steel. When drilling, a support should be used to assure a clean hole. VIROC® is a panel of wood and cement, it is not concrete, so percussion braces should not be used, nor concrete drills. The boards that have surface treatment already applied must always be drilled form the front side (treated) to the back. The other way around can damage the already applied treatment.



## sanding

The VIROC® panel can be supplied already sanded. This treatment gives the board a different look, making the thickness tolerance in manufacture to diminish.

This shortage is of 0.3 mm. Manual Sanding can also be made in the joint areas of the boards, in situation where they are uneven and this needs to be removed. Sanding jobs have to be done outside and in inside ambiences the dust must be vacuumed.

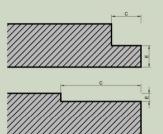
Machines: vibration or belt sanding (skate or band).

Tools: sand sheet of 40 to 80 of grain. Opened structure. Opencat Linear speed: 20 to 28 m/sec.

# milling and turning

The edges can be machined in bevel, tongue-groove, tapered or half-lap. During machining about 15 mm are lost for alignment of the machine the standard dimensions are presented (others under requested).

- Machines: milling machine: lathe
- Tools: tungsten carbide or of fast steels to mill, to slot, to round, to mortise, half-lap, tongue-groove, etc.
- Linear speed: 25 to 35 m/sec.





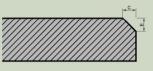
HALF LAP

Thickness Th/2 ± X

Lenght: 10 mm ± 1 mm

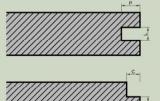
X - Thickness tolerance | Th - Panel thickness

Thickness: 2 mm ± X
Lenght: 30 mm ± 1 mm
X - Thickness tolerance | Th - Panel thickness



#### BEVEL

Thickness: 3,5 mm ± 1 mm
Lenght: 3,5 mm ± 1 mm
X - Thickness tolerance | Th - Panel thickness



#### TONGUE - GROOVE [mm]

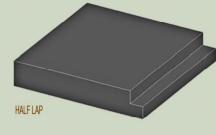
Groove			Tongu	e	
Esp	L	P	E	C	
16	5,0(+0,2)	6,0(+0,2)	4,8(-0,2)	5,0(-0,1)	
19	6,0(+0,2)	7,0(+0,2)	5,8(4)2)	6,0(-0,1)	
>22	7,0(+0,2)	8,0(+0,2)	7,8(-0,2)	7,0 (-0,1)	

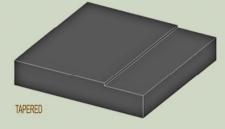


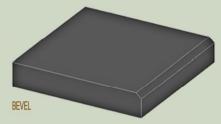
#### RAMP TONGUE - GROOVE [mm]

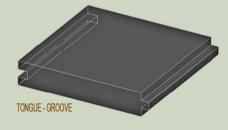
WHILL LOUGOF - OLOGAT [IIIII]						Щ	
Esp	A	В	C	D	Ε	F	G
16	19	9.5	6	4	3	1	2
19	19	9.5	7	5	4	1	2
22	19	9.5	8	6	5	1	2
25	25	12.5	9	7	5	1.5	2.5
28	25	12.5	10	8	6	1.5	2.5
32	25	12.5	11.5	9	7.5	1.5	2.5
36	25	12.5	13	10	9	1.5	2.5
40	25	125	145	11	10.5	15	25

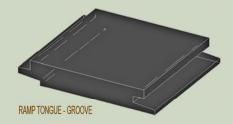












# 4.2 finishing COATINGS

The VIROC® Panel is compatible with a wide variety of protective and decorative coatings being surfaced an excellent basis for them. Compatibility with various materials ensures a wide field of final solutions where aesthetic intentions may be associated with the final aspect of VIROC® as finishing, or with other compatible materials where VIROC® is hidden and have only a functional and structural action. Coatings and finishing should take into account the alkalinity of the VIROC® (pH from 11 to 13) and that the cement represents 70% of the weight of the Panel. Before applying any coating the surface of the Panel should be completely dry and clean.

Taking into account the wide range of applications and uses of the product VIROC®, it is essential that, in each case, to verify the compatibility of VIROC® with the other products used as a way to ensure that no problems occur, arising from incompatibility between the various materials used, which of course are not the responsibility of VIROC Portugal S.A.

## primers

The VIROC® primer may be supplied with sanded acrylic white (primer). Primer function:

- Protect and reduce the absorption of water and moisture in dashboard
- ensuring perfect paintings subsequent adhesion or other materials

The primer should be chosen according to the compatibility with paint or varnish to apply later. In any situation of implementation should be carried out at primer 6 faces Panel before being placed in its final position.

#### varnishes

The application of varnish on the VIROC® panel allows you to respond to various requirements decorative serving also protection against assaults on the environment where it belongs, such as sunlight, weather, ensuring the durability and maintaining your appearance unchanged over time. Varnishes may have different compositions as final point to make, may be added pigments or binders, some of these compositions may lead to a different shade of the original color and take into account all the properties of varnish before it is applied as well as know the manufacturer's recommendations.

For the application of varnish on boards, areas should be completely clean and dry, without fats or powder and primer layer applied. In general the varnishes are easy application, but it is very important to bear in mind that the application should be continuous and constant to ensure uniformity of finishing on the board, so that the surface is not tainted and with different shades.

# finishing .4











#### 1. VIROC® GREY with acrylic varnish on primer.

Portuguese National Guard (GNR) - Gafanha da Nazaré, Portugal 2. Pigmented coating with iron oxide.

Caixa de Crédito Agrícola - Oliveira do Hospital, Portugal 3. Acrylic paint.

Services building - Lisboa, Portugal

4. Wall – ceramic coating | ceiling – VIROC® Grey with acrylic varnish.

Hotel - Funchal, Portugal

5. Ceramic coating. Hotel - Funchal, Portugal



# finishing .4

## painting

The painting of VIROC® panels aims to encompass the Panel in the context of decorative serving also protection against assaults on the environment. Painting must always be applied on a primer that stabilizes the surface of the board and limits the absorption of final finishing.

The nature of the outer layer visible depends only on the surface that is. The ink to be used should be suitable for outdoors, applied on cement base areas or concrete. The ink to be applied should always be recommended by the manufacturer in layers needed to finish that intended. It is recommended to conduct a preliminary test before the final application to test the necessary layers to the desired effect. The desired ink pigment contained in it must be stable because alkaline pigments are unstable and may cause, over time, changes in the desired color tone. CAL inks are not appropriate.

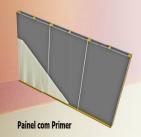
The final aspect of application may hide or not together as desired. If you want to hide the joints, filling is required throughout its area. When the joints of the boards are in sight, their edges must be treated with the same color composition. Board surface must be dry and clean for the application.

# thermical insulation system from the exterior

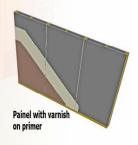
The thermal insulation system from outside is a method of insulation of buildings in which they are placed at expanded polystyrene boards. The boards are covered and reinforced by mass armed with adhesive glass fiber network to protect the system. The surface is finished with a final coating, conferring protection and ultimate desired permanent decor, similar to a traditional construction.

## ceramic coating

The ceramic coating should always be done on the Panel with prior placing a primer in 6 faces. The accession of clay to the Panel should be conducted with flexible, gluing products should be placed across the surface and not just on time. Joints of ceramic should coincide with the seams of panels.



VIROC 4 | 5



#### coating with paint

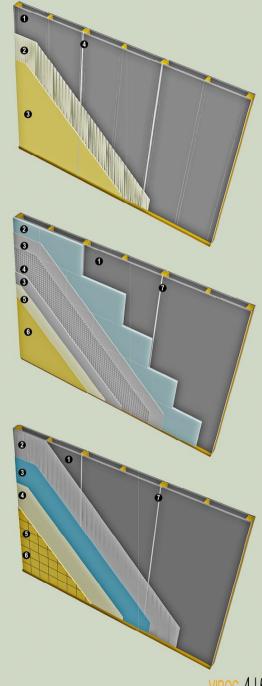
- 01 VIROC® Panel.
- 02 Primer.
- 03 final painting job.
- 04 VIROC® boards' dilatation joints (5 mm) Joints with elastic mastic filling.

#### thermical insulation system from the exterior

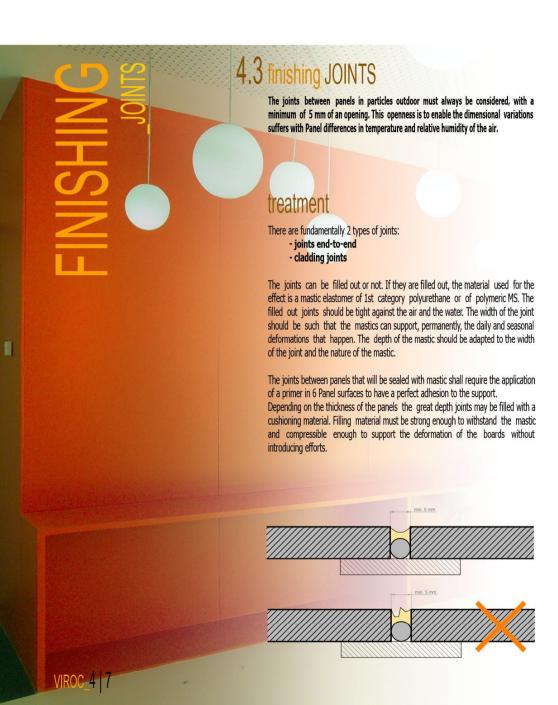
- 01 VIROC® panel.
- 02 Expanded polystyrene board.
- 03 Adhesive mass.
- 04 Glass fiber net.
- 05 Water-based primer.
- 06 Final plastic coating.
- 07 VIROC® boards' dilatation joints (5 mm) Joints with elastic mastic filling.

#### ceramic coating

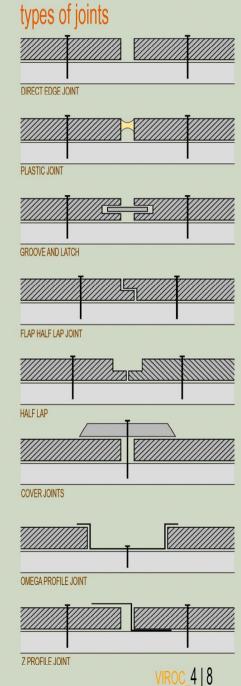
- 01 VIROC®Panel.
- 02 Primer.
- 03 Insulating hidromass painting.
- 04 Flexible adhesive cement.
- 05 Ceramic tiles.
- 06 Joints of ceramic with adhesive additive.
- 0'7 VIROC<sup>®</sup> boards' dilatation joints (5 mm) Joints with elastic mastic filling.



# finishing .4



# joints schemes CLADDING JOINT JOINT END-TO-END system description 01 Filling material (polyethylene bead) 02 1st category mastic elastomer 03 Joint Flap



# 4.4 finishing FIXING nailing

Nailing is one of the methods for the establishment of VIROC® panels' support. The nailing method is only used for fixing wood structures. It is important to take into account the environment in each application, because this method should not be used in situations of great exposure or structure board not already allows dimensional large variations on the Board.

There are various types of nails applicable as of flat head (plane), in stainless steel or galvanized, smooth, threaded or twisted, resined or not in function with the

Diameter: 2 to 3 mm.

Length: 3 to 3,5 times the panel's thickness.

#### **Fixation Techniques:**

- For thickness up to 12 mm, nailing in the face can be done manually without pre-drilling.
- With higher thickness than 12mm, it needs pre drilling, except if one uses pneumatic tools.
- Avoid the shock of the hammer in the panel.
- Maintain the panel properly positioned against the structure (firmly leaned to the structure) during the nailing.

## glueing systems

VIROC® Panel fixation can be done by gluing, both in metallic s tructures as wood ones. Gluing can serve as a complement to mechanical fasteners, contributing to more homogeneous uptake of the Panel in its entire surface, but always ensuring some slack in their movements once its fixated. It is a good choice when you want flexibility to adapt to entries in the structure, thus advised its application in situations of walls, façades of buildings. Gluing may be the only Panel fixation in various situations as decks or in the production of pieces of furniture.

The type of glue to be used is mastic elastomer 1st category, polyurethane for interiors and external, acrylic for interiors or polymeric MS.

For the best application of glues, should apply a continuous string of the same throughout the perimeter of the Panel and in the rest of the area to apply continuous cord with 60 cm spacing in all directions.

Always consult mastics manufacturer and apply in accordance with their respective technical specifications.

## screwing

The most common system due to its ease of application to fix the VIROC® panels is via screws. Enabling support structure to be of wood or metal. Due to the similarity of the +performance of materials to use wooden structure is more appropriate.

The dimensional variations VIROC® panels suffer with differences of air humidity. The coefficient of dimensional variation of the VIROC® Panel is 0.01% of the variation 1% relative humidity of the air in extreme amplitude conditions, humidity dry-wet, the Panel may suffer deformation of 0.4%. For this reason it is recommended in outer environment. sunlight using external head associated with a punch with a diameter greater than the

The type of outdoor use screw should be stainless or with a special protection against corrosion type "Dacrimet" or "delta Seal". The screws with a simple galvanic protection should only be used indoors; this is the case of the SC collection.

SCREW VIROC EMAD D12 external head

# outdoor fixing elements

#### Screw VIROC EMET D14 external head

L = 32 mm
VIROC Thiokness - 12 a 16 mm
Head = 14,5 mm
Thiokness = 4,8 mm
Pre drilling in the VIROC - 9 mm
Structure thickness - 1 a 3 mm

#### Rivet VIROC

L = 25 mm (VIROC thick. 12 and 16) Head (d2) = 16 mm
Thickness (d1) = 4,8 mm \_\_\_\_\_\_M=32 mm Pre drilling in the VIROC - 10 mm Structure thickness - 5 mm max.

#### Screw VIROC EMAD D12 external head

L = 38 mm (VIROC thick. 12) L = 44 mm (VIROC thick. 16) L = 60 mm (VIROC thick. 19 to 22) Head = 12 mm Thickness = 4,8 mm

Pre drilling in the VIROC - 8 mm



# indoor fixing elements

#### Screw VIROC IMET D8 flat head

L = 30 m W VIROC thickness - 8 to 16 mm Head = 8 mm Thickness = 4,2 mm Pre drilling not needed Structure thickness - 0,7 to 2 mm

#### Screw VIROC IMET D12-5 flat head

L = 38 mm (VIROC thick. 8 to 19) L = 45 mm (VIROC thick. 22 to 25) L = 55 mm (VIROC thick. 28 to 32) Head = 12 mm Thickness = 5,5 mm
Pre drilling not needed
Structure thickness - 2 to 5 mm

#### Rivet VIROC

L = 25 mm (VIROC thick. 12 and 16) Head (d2) = 16 mm
Thickness (d1) = 4,8 mm M = 32 mm

Pre drilling in the VIROC - 10 mm

Structure thickness - 5 mm max.

#### Screw VIROC IMET D9 flat head

L = 35 mm (VIROC thick. 8 to 19) L = 45 mm (VIROC thick. 22 to 28) L = 65 mm (VIROC thick. 32) Head = 9 mm Thickness = 4,8 mm
Pre drilling not needed Structure thickness - 2 to 3 mm

Screw VIROC IMET D12-6 flat head L = 45 mm (VIROC thick. 8 to 22) L = 50 mm (VIROC thick. 25 to 28) L = 55 mm (VIROC thick. 32) Head = 12 mm Thickness = 6,3 mm Pre drilling not needed

Structure thickness - 3 to 6 mm

#### Screw VIROC IMAD D12 flat head

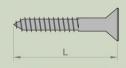
L = 38 mm (VIROC thick. 8 to 16) L = 50 mm (VIROC thick. 19 to 32) Head = 12 mm Thickness = 5,5 mm
Pre drilling not needed



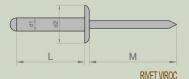
SCREW VIROC IMFT D8 / D9 flat head



SCREW VIROC IMET D12-5 / D12-6 flat head



SCREW VIROC IMAD D12 flat head



# **5.1** applications FAÇADES

The application with the most distinction and excellence for the VIROC® panel and where it's mostly used, is for coating façades.

Choosing this option is not only because of the esthetic characterized by the heterogeneity but also because of its good performance considering the elements it gets exposed in outdoors.

The use of VIROC® panels in façades ensures several advantages due to be a building material that can be applied in the outdoors, with good behavior to sunlight, wet and dry cycles of rainwater, the ice and thaw cycles, for his sound and mechanical resistance by its ease of implementation and workability.

The recognized mechanical resistance characteristics, acoustics, thermal and fire when applied with an adequate system of support and fixing contributes to the comfort of the buildings.

Compatibility with various solutions and different final finishing materials allows a very varied choice by original appearance that is presented in three know shades, grey, black and white, or apply a different final finishing on the Panel, which could be through painting with wishing effects or with a ceramic coating.

It is noteworthy that both sides of the Panel are identical and can be applied without discrimination. Very advantageous when the acts of vandalism such as graffiti painting, unable to repair the aesthetic aspect by simple Exchange facade of the visible face of the Panel.

The façades are the most visible and important element of a building, due to its complexity, the VIROC® provides technical advice through their next to all players in the process, for each particular situation. Proposing solutions, validating details in accordance with our extensive experience in work carried out, improving performance and durability VIROC® Panel.

The minimum thickness of panels for facades VIROC® is 12mm, being necessary to apply a surface finish through paint or varnish.

# applications .5











HILL CONTROL

1. Medical centre

Massamá Portugal

2. Portuguese National Guard Headquarters
Gafanha da Nazaré, Portugal

3. Services Building in Eiras Coimbra, Portugal.

Castanheira do Ribatejo, Portugal.

5. Civic swimming pool Esmoriz, Portugal

# 5.2 applications WALLS

One of the possible VIROC® Panel applications is in building partitions or structural in interiors and exteriors.

Is an application where the Panel performance highlights the characteristics and strengths of the same, for ease of implementation and workability, with the added advantage of being able to be applied and confer immediately final finishing.

The characteristics of mechanical, thermal resistance, resistance to fire when applied with an adequate system of support and contribute to an excellent solution.

It is noteworthy that in certain situations, in hotel rooms divisions, housing and other buildings, where air resistance acoustic sounds and percussion is fundamental, the use of VIROC® Panel, being one of the most appropriate solutions.

The mechanical strength, durability and ease of maintenance make VIROC® indicated panels for the interior lining in buildings of large turnout of people as is the case of public buildings.

Pens moist inner also areas listed for use VIROC® Panel, due to its good behavior with humidity as are examples of swimming pools, showers and toilets in General.

VIROC® panels can be used in the manufacture of securities diverse as benches, washbasins, lockers, cupboards and ports. Ease of cleaning and disinfection products resistance enables easy maintenance.

In any of the situations, inside or outside the VIROC® Panel can be used as coating and finishing of existing walls.

Compatibility with various solutions and different final finishing materials allows a very varied choice by original appearance that is presented in three shades known **grey**, **black** and **white** or apply a final finishing on the Panel, which could be through painting with wishing effects or with a ceramic coating.

The minimum thickness of VIROC® panels used in dry areas inner walls is 10 mm. Applications in wetlands are these inner or outer is 12mm. Wetlands is always necessary to perform a surface finish through varnish or paint.

# applications .5













Madeira, Portu

2. Photography studio
Lisboa, Portugal

3. Cultural facility

Portuguese National Guard Headquarter
 Gafanha da Nazaré, Portugal

5. Infobox - Electricity Museum

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# 5.3 applications FLOORING

The construction of structural flooring or flooring coatings in outdoors and indoors is another of the various application possibilities of the VIROC® panel.

The VIROC® panel responds perfectly to the specific requisites of the flooring construction. The excellent characteristics concerning mechanical resistance, to air sounds and percussion, the thermal resistance, to the fire, fungus, termites and rodents when applied with an adequate system of support and fixation will contribute to an excellent solution.

This is a kind of application where the performance of the panel enhances its characteristics, by the easy application and workability, with the additional advantage of being able to be applied and immediately allow the finishing result.

Humid spaces are also proper areas to use the VIROC® panel, due to the good performance with humidity, one of the areas of application of the VIROC® panel in flooring is in remodeling of old buildings, especially when it concerns old forms of wood flooring which degrade with water that might come up in the toilet and kitchen areas.

In any of the situations, indoor or outdoor, the VIROC® panel can be used as a coating of finishing of flooring that already exists.

Its compatibility with various solutions and different final finishing materials allows a very varied choice by original appearance that is presented in three shades known as **grey**, **black** and **white** or apply a final finishing on the Panel, which could be through painting with wishing effects or with a ceramic coating.

The boards can be straight edges or machined type male-female, when applied with male-female this connection should be pasted in order to ensure continuity of the performance. VIROC® has two ranges of products suitable for floors with the names of VIROCFLOOR and VIRODAL. In applying these systems transverse joints deck boards should be offset.

VIROC® Panel surface is used like a wood floor, the allowable loads vary with the thickness of the board and remoteness between support beams. The VIROC® provides a table of loads and safety checklist form.

The minimum thickness of VIROC® structural panels used in decks being in indoors or outdoors is of 19 mm. When used as coating, without structural and functions based on an existing minimum thickness surface is of 16. In all applications in which the VIROC® visible and coating material is necessary to apply a surface finishing using appropriate paint or varnish.













MAGES

"Casa Decor" 2005
 Madrid, Spain
 Indoor Comercial space
 Porto, Portugal
 "Casa Decor" 2005
 Madrid, Spain
 Hooring and Indoor stairway.

Porto, Portugal

5. Outdoor flooring – comercial area













The VIROC® Panel is another great scope of dropped ceilings, enabling to obtain excellent results both esthetic as for durability, due to its mechanical strength, to fire, humidity and air sound resistance, both indoors as in the outdoor.

Its use in the outdoors is one of the preferred application fields due to the resistance to humidity of rainwater of the VIROC® Panel.

The VIROC® Panel is an easy application and workability material, providing its applications easy replacement.

Its resistance to sound associated with particular drilling results in a well-used solution in sound absorption.

In the application of dropped ceilings it should be provided joints both in the outdoors as in indoors.

The minimum thickness of the VIROC® panels used in dry indoors ceilings is of 10 mm. The a pplications in wetlands being outdoors or indoors is of 12 mm. In Wetlands it's always necessary to perform a surface finishing by using paint or

> 1. Indoor Dropped Ceiling - PROAP Atelier Lisboa, Portugal 2. Outdoor Dropped Ceiling - Tram terminal. Madeira, Portugal.
>
> 3. Outdoor Dropped Ceiling – Housing Building.
> Lisboa, Portugal

4. Dropped Ceiling in Public Parking Lot.
Ribeira da Boa Ventura, Madeira, Portugal 5. Outdoor Dropped Ceiling - Housing Building.











# 5.5 applications ROOF STRUCTURES

Due to its thermal resistance, mechanical strength and resistance to air sounds the VIROC® Panel plays an excellent performance in roof support.

Being a material which does not degrade when exposed in the outdoor, it can be used as the final finishing coating. This application requires that there be a waterproofing system to ensure the watertight integrity.

When applied as a roof structure support, it should take care that the loads that the VIROC® Panel will be subjected to, since its strength depends on the thickness of the board and remoteness between support beams. VIROC® provides a table of loads and how to verify security.

In the case of the roof structure being to visit, this should be conducted with the VIROCFLOOR system or with the VIRODAL system, following all directions for these two cases. In Roof structures that are not to visit the application on the supporting structure should be performed as indicated by VIROC®. The minimum thickness of the VIROC® roof structure panels is 12 mm.

1; 5. Support of the roof structure of a church - Braga, Portugal

2. Coating of the roof structure

 V. N. Famalicão, Portugal
 VIROC in sandwich panel for a roof structure Palma de Maiorca, Espanha.

4. Roof structure in modular construction

- Carvalhal, Grândola, Portugal.

ROOF STRUCTURES

# CHCATIONS LOST FORMWORK

# 5.6 applications LOST FORMWORK

The VIROC® Panel, with its rigidity, resistance and durability characteristics, allow that this product has excellent performances in the application of lost formwork.

Being the rigidity and resistance in flexion the biggest issues in the use of panel in lost formwork, the factors that mostly define the performance in the application is the thickness of the panels to be applied in each situation. The most important information to take into account for the thickness of the VIROC® panel is:

- Distance between supports
- Thickness of the concrete application

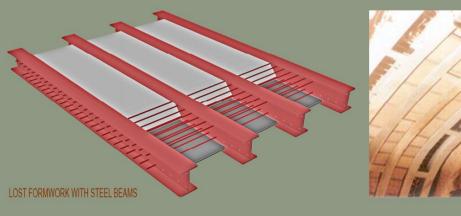
To determine the dimensions of the lost formwork panels, the most lucrative way in terms of waste and handling of the boards at work, is a length of 1250 mm.

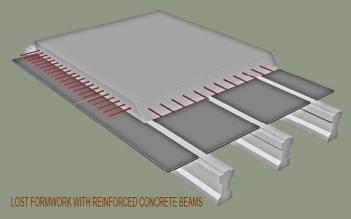
The width of the lost formwork panels is determined by the distancing of the beams, these being metallic or in reinforced concrete, with an add of 4 cm in each side, which is the minimum length of support of the boards on the beams.

#### IMAGES

- 1. Preparation of formwork for Viaduct
- 2. Railway Tunnel
- Z. Kaliway Tulin
- 3. Highway Viaduct









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# 5.7 applications VIROCLIN SYSTEM

The **VIROCLIN** is a system that was designed to be applied in façades or vertical links of any kind in the outdoor or indoor. Consists of VIROC® strips with 300 mm of width and 2440 mm of length.

It is a fast and easy installation system with all the advantages of the properties of the VIROC® Panel features. It also has an anti-wrenching system that protects the façade of large storms and acts of vandalism, important factor in today's days associated VIROC® panel's resistance properties, make the VIROCLIN system, hard, durable and unbreakable.

By the way it was designed and is applied, the VIROCLIN doesn't present visible fixation elements (screws) because they are hidden by overlapping of boards.

## finishing

The finishing of the VIROCLIN is the same you use in façades, depending on the aspect that is intended. A paint or varnish can be applied. The finishing from the Factory is with the hidden surface sanded with one layer of primer and the surface at sight is in brut for subsequent painting, with the application of the primer while at work.

# dimensions

2440 x 300 x 15 mm



#### IMAGES:

Madeira, Portugal.

2. Monção Eco Museum
Monção, Portugal

3. Comercial area

4. Monção Eco Museum Monção Portuga 5. Sports Pavillion

 Sports Pavillion Madrid, Spain.





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