

viroc
by **Investwood**

Cement Wood Board

Technical File

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1. PRODUCT

1.1 Description

Viroc® Cement Bonded Particle Board

Viroc is a composite material, composed by a compressed and dry mixture of pine wood particles and cement. It combines the flexibility of wood with the strength and durability of cement, allowing a large range of applications, both indoor and outdoor.

Its appearance is not homogeneous. A natural characteristic of the product is to have patches of various shades.

Viroc can be factory calibrated/sanded (for applications requiring tighter tolerances). Once calibrated, presents visible wood particles on the surface.

1.2 Range

Colours / Thicknesses unsanded (mm)	8	10	12	16	19	22	25	28	32	Dim. (mm)
Black NG	•	•	•	•	•	•	•	•	•	3000 x 1250 2600 x 1250
Grey CZ	•	•	•	•	•	•	•	•	•	
White BR			•	•						2600 x 1250
Ocher AC			•	•						
Yellow AB			•	•						
Red VM			•	•						

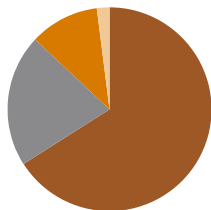
Thicknesses sanded (mm): 8, 12, 15, 18, 21, 24 and 28.

1.3 Dimensions

2600 x 1250 mm / 3000 x 1250 mm

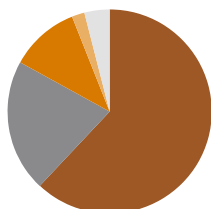
Other dimensions under request.

1.4 Composition per Kg



The composition of Viroc Grey and Viroc White is:

- 66% Portland Cement (CEM II / A - L 42,5R)
- 21% Wood (Portuguese Maritime Pine - Pinus Pinaster)
- 11% Water
- 2% Other non toxic compounds (sodium silicate and aluminium sulphate)



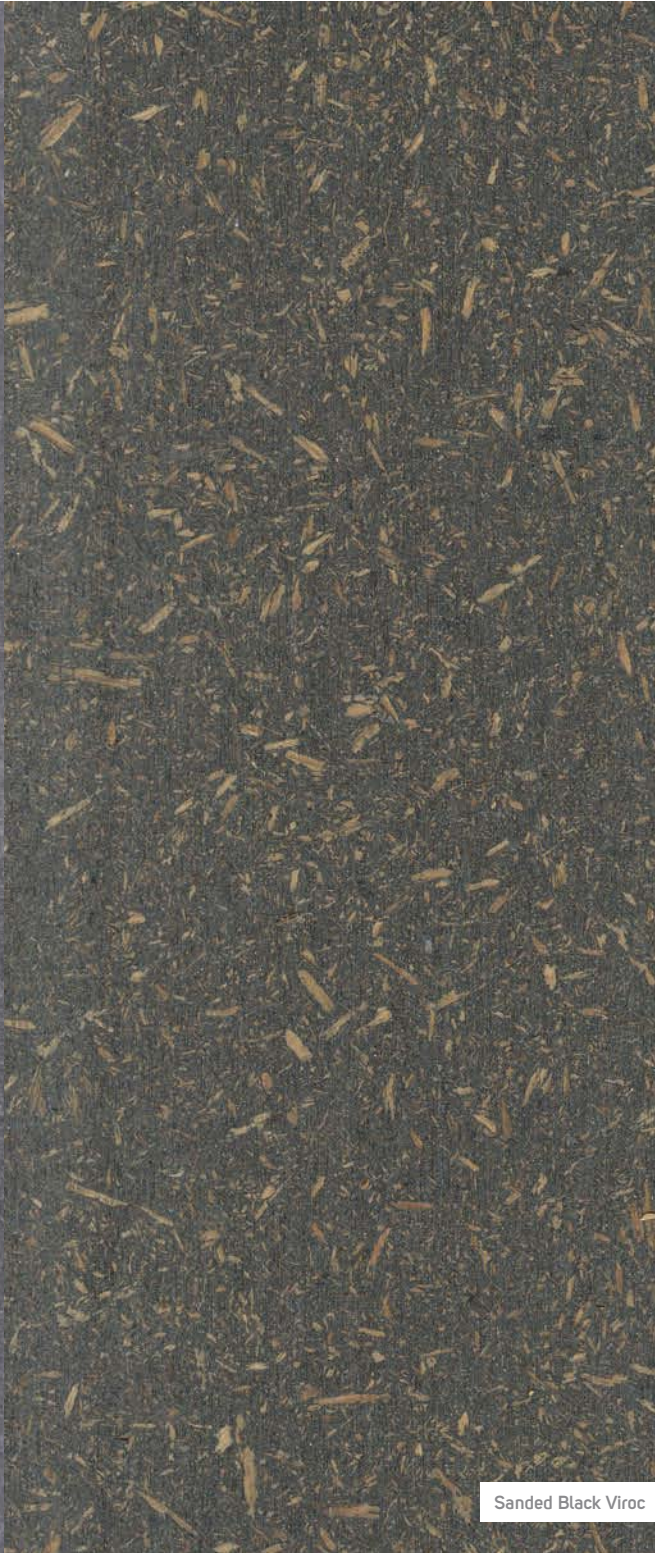
The other colours are composed by:

- 62% Portland Cement (CEM II / A - L 42,5R)
- 21% Wood (Portuguese Maritime Pine - Pinus Pinaster)
- 11% Water
- 2% Other non toxic compounds (sodium silicate and aluminium sulphate)
- 4% Pigment

1.5 Viroc unsanded & Viroc sanded



Unsanded Black Viroc



Sanded Black Viroc



Unsanded Grey Viroc



Sanded Grey Viroc



Unsanded White Viroc



Sanded White Viroc



Unsanded Ocher Viroc

Sanded Ocher Viroc



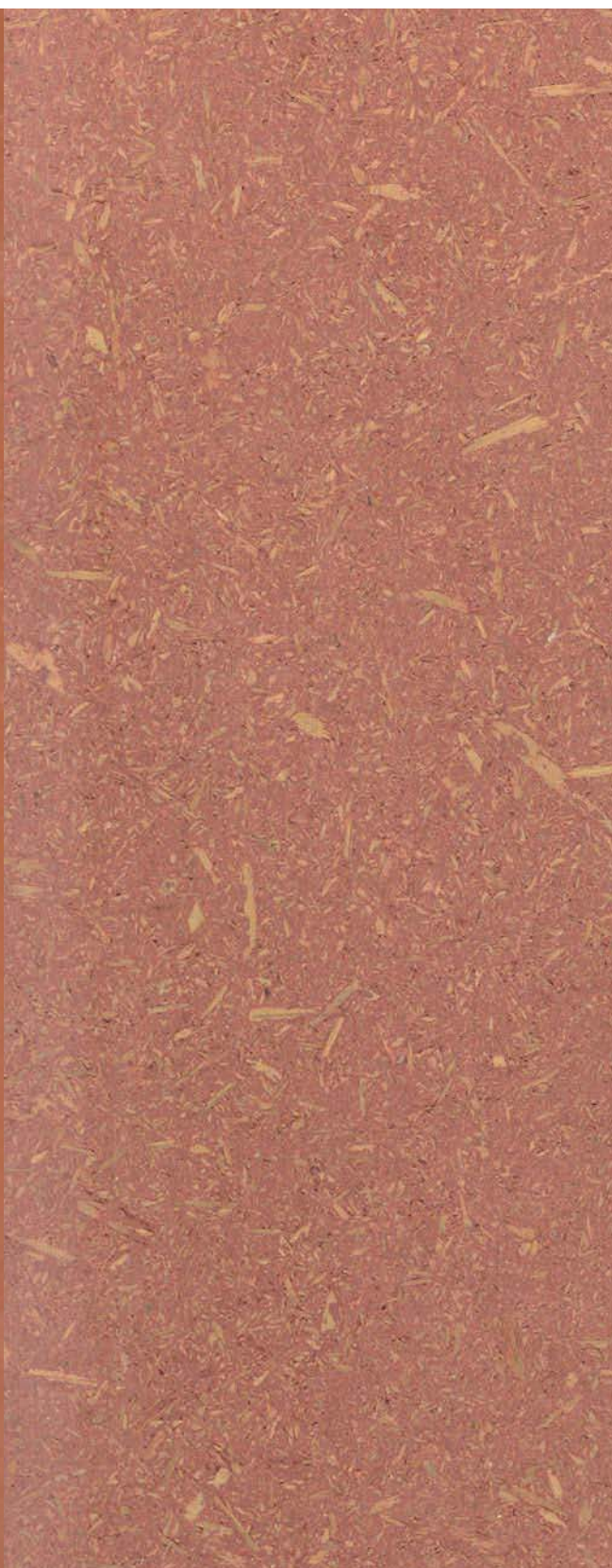
Unsanded Yellow Viroc



Sanded Yellow Viroc



Unsanded Red Viroc



Sanded Red Viroc

1.6 Technical specifications

Properties

Feature	Unit	Value					Standard
Density	Kg/m ³	1350 ± 50					EN 323
Swelling (24 hours)	%	1,5					EN 317
Moisture content at dispatch from manufacturer	%	9 - 12					EN 322
Modulus of elasticity	N/mm ²	4500					EN 310
Internal bond	N/mm ²	0,50					EN 319
Bending strength	N/mm ²	9					EN 310
Superficial alkalinity	pH	11 - 13					-
* Thermal conductivity	W/m.C	0,22					EN 12664
* Higher heating value, PCS	MJ/Kg	4 ± 0.5					EN ISO 1716
Water vapour resistance factor		Wet cup μ = 30 Dry cup μ = 50					EN 12524
* Reaction to fire		< 16 mm = 0,6 mm/min. ≥ 16 mm = 0,5 mm/min. B – s1, d0 Class 0					DTU p 92-703 EN 634 - 1 EN 13501 - 1 BS 476: Part 7
Coefficient of sound absorption		250Hz - 500Hz α =0,10 1000Hz - 2000Hz α =0,30					EN 13986
* Weighted sound reduction index	Thickness (mm) Rw (C; Ctr) (dB)	8 31(-1;-3)	10 32(-2;-3)	12 33(-1;-3)	16 35(-2;-3)	19 35(-1;-2)	22 37(-2;-3)

* Tests performed on Viroc Grey boards.

Product Weight

Thickness (mm)	Dimensions (mm)	Weight (kg/board)	Weight (kg/m ²)
8	2600x1250	35	10,8
	3000x1250	41	
10	2600x1250	44	13,5
	3000x1250	51	
12	2600x1250	53	16,2
	3000x1250	61	
16	2600x1250	70	21,6
	3000x1250	81	
19	2600x1250	83	25,7
	3000x1250	96	
22	2600x1250	97	29,7
	3000x1250	111	
25	2600x1250	110	33,8
	3000x1250	127	
28	2600x1250	123	37,8
	3000x1250	142	
32	2600x1250	140	43,2
	3000x1250	162	

Palletizing table

N° Boards x Pallet

Thickness (mm)		08	10	12	16	19	22	25	28	32
Dimensions	2600x1250 mm	60	48	40	30	25	24	21	18	16
	3000x1250 mm	57	46	38	28	24	23	20	17	15

1.7 Advantages



Non toxic

Does not contain dangerous volatile compounds and is free of silica, asbestos and formaldehyde.



Sound insulation

It has good sound insulation properties due to its high weight.

The sound insulation index varies according to board thickness. Airborne sound resistance is 31 or 37 dB depending on whether board thickness is 8mm or 22mm, respectively.



Weight resistant

The board has a bending strength that enables it to be used as a resistant structural element. It is therefore used in flooring and as roof support.

The bending strength is 9 N/mm² with a modulus of elasticity of 4500 N/mm².



Easy installation

It can be cut, drilled and sanded. The tools and fastening systems used for Viroc boards are identical to those used with wood.



Fire retardant

It prevents the spread of fire. According to the ignitability test conducted, it is classified as B-s1, d0 in accordance with EN 13501-1.



Moisture resistant

Under the action of water it does not disaggregate.

It is a material impermeable to water.



Thermal insulation

It has good thermal resistance properties, meaning that it can function as insulation in both cold and hot temperatures.



Insect resistant

It will not degrade with the action of living organisms such as fungi, termites or any kind of insects.

1.8 Applications

The Viroc board is used for structural or covering functions. It may be applied on wood or metallic supporting structures.

It must be protected in outdoor applications with paint or varnish.

It can be used in the following applications due to its versatility:

- Facades
- Partition walls and walls cladding
- Flooring
- Suspended ceilings
- Roof supports
- Lost formwork
- Interior design
- Urban equipment

1.9 Warranty

The VIROC panel is guaranteed against deterioration for a period of 10 years from the date of purchase. This warranty is not transferable and only applies if the VIROC panel is stored and installed according to the recommendations of Viroc, SA, and in accordance with good construction practices, if it has never been disassembled from an application and reused in another, if it has not been exposed to acids, chemicals or vandalism, if the structure is aligned and not deformed, and if the screws are not damaged.

Viroc, SA reserves the right to compensate the customer by replacing the material or refunding the factory with the purchase price.

2. PRODUCTION

2.1 Production process

1. Obtaining chips

The Viroc boards manufacturing process begins with the removal of the bark from pine logs. The trunks are cut and sliced, turning the wood into chips. These chips are graded and classified as fine and coarse.

2. Mixing

The wood chips, water, additives and finally the cement are batched in the mixer to form a glutinous mass called the mixture. All the raw materials are weighted on electronic scales that are regularly calibrated.

3. Formation of the mattress

The mixture is conveyed to the forming machine where it is distributed and deposited on steel plates, previously sprayed with an oil, to form a mattress of uniform thickness. The finest elements of the mixture are deposited at the mattress surfaces in contact with the plate, leaving the cement in sight.

4. Pressing

The plates with the mattress are stacked to a certain number depending on the thickness of the boards to be manufactured.

This stack is then compressed on the trolley that transports it, forming the Viroc boards.

The set of boards that is pressed is called the batch. Each batch is assigned a number which is associated with all the quality control tests that are performed.

5. Curing

The batch is placed in a curing oven that is intended to accelerate the curing process. In this oven under the effect of pressure, temperature, humidity and time, the board acquires resistance so that it can be processed.

The press is removed from the batch and the boards are separated from the plates. The boards are pre-cut and then stacked and placed in curing. The plates are cleaned and re-enter the production circuit.

During curing, the hydration chemical bonds of the cement are concluded.

6. Drying

Finally the boards pass through a drying tunnel in order to remove excess moisture.

The production of the boards is now terminated.

7. Quality Control

Tests are conducted to ascertain the features of the board produced.

8. Cutting and packaging

2.3 Hygiene and safety

Viroc boards are non toxic, contain no hazardous volatile compounds and are free of silica, asbestos and formaldehyde. They do not present any danger to health or the environment and are not combustible.

Handling

It is recommended that appropriate mechanical equipment be used to move the Viroc boards, or if this is not available, then manual tools should be used to support handling.

Always use personal protective equipment such as gloves and boots.

When Viroc boards are manually moved they must be transported in a vertical position.

Machining

During the machining of Viroc boards dust is released that does not constitute health risk but may cause irritation to sight and the respiratory system.

Use personal protective equipment such as goggles, dust mask and ear plugs.

Use work equipment with dust extraction systems, whenever possible.

Waste

Waste and the surplus product of boards must be disposed of in appropriate locations authorised for this purpose. This product is not biodegradable.

2.4 Storage, transportation and packaging

Storage

Viroc boards must be stored horizontally in flat areas, on props. The props must have sufficient height to be easily transported by a forklift. They should be evenly spaced around the centre with a maximum spacing of 600 mm, and have props at the edges. If pallets are placed on top of each other, the props of each one must be aligned with the underlying pallet, to prevent deformation of the boards. When stored outside, the Viroc board must be protected with plastic film.

Transport

The boards must be protected by waterproof covering during transport. The edges of the boards must be protected to prevent damage from ropes, belts or other securing systems. The protection of the edges, corners or faces must be maintained until the boards are installed.

Packaging

The Viroc boards have an ex-works moisture content of 9-12% and are at equilibrium when the temperature is 20°C and relative humidity is 60 to 80%.

To guarantee installation conditions, the board should adapt to the humidity environment of the application site for 48 hours (minimum) before being handled and fitted.

3. FINISHINGS

3.1 Machining

Cutting

The Viroc board may be machined just like wood.

A portable circular saw can be used for thicknesses to 19 mm.

A workbench saw should be used for greater thicknesses or large cutting volumes, as it permits better surface quality and easier implementation of hygiene and safety requirements. The teeth of the saw blade must be alternated or trapezoidal, with tungsten inserts for cutting wood or aluminium.

It is recommended that the board is firmly fixed when cutting so as to avoid vibration and consequent damage.

Take into consideration the width of the saw blade when cutting the board, generally from 3 to 5 mm.

The dust released during cutting must be vacuumed to protect the environment.

Blades for wood or metal must be mounted when a jigsaw is used for cutting.

Drilling

Holes may be drilled in the Viroc board with a conventional drill using drill bits suitable for drilling metal, and without percussion.

Sanding

The Viroc board can be supplied calibrated/sanded. When the board is sanded, wood particles become visible on the board surface.

The thickness tolerance of the sanded board is ± 0.3 mm.

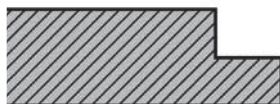
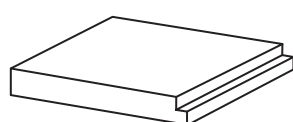
Vibratory disk or belt sanders can be used.

Milling and turning

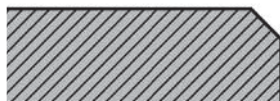
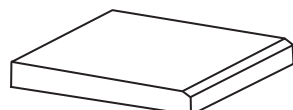
Edges can be machined to form bevel, tongue-groove or half-lap joints.

The milling bits should be tungsten carbide.

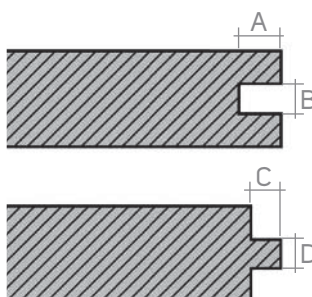
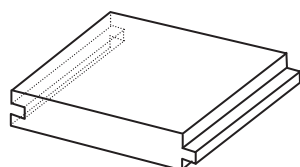
Half-lap-joint



Bevel



Tongue and groove



Thickness	A	B	C	D
16 mm	5,0 ($\pm 0,2$)	6,0 ($\pm 0,2$)	4,8 ($\pm 0,2$)	5,0 ($\pm 0,2$)
19 mm	6,0 ($\pm 0,2$)	7,0 ($\pm 0,2$)	5,8 ($\pm 0,2$)	6,0 ($\pm 0,2$)
>22 mm	7,0 ($\pm 0,2$)	8,0 ($\pm 0,2$)	7,8 ($\pm 0,2$)	7,0 ($\pm 0,2$)

3.2 Coatings

The Viroc board is compatible with a wide variety of decorative and protective coatings.

The coatings and finishes should always take into account Viroc's alkalinity (pH 11 to 13) and also that cement accounts for about 66% of its weight.

Prior to applying any coating, the surface of the board should be completely dry, clean and free of salts, oils or fats. Given the wide range of applications and uses of the Viroc board, it is essential that the compatibility of Viroc with other products be verified in each case, in order to ensure that problems do not occur caused by incompatibility of the different materials. In such an event, this is of course not the responsibility of Viroc, SA.

Varnishes

The application of varnish on the Viroc board aims to protect it from the environment where it is installed, such as exposure to sunlight and weather, ensuring the durability and keeping its appearance unchanged over time.

The application of a varnish may change the shade of the natural colour of the Viroc board, giving it a "wet" appearance with a certain amount of shine.

Before applying varnish the panel surfaces must be completely clean and dry, free from grease, dust or surface salts. The surface should be cleaned by polishing with a cleaning disc or sanding with very fine sandpaper.

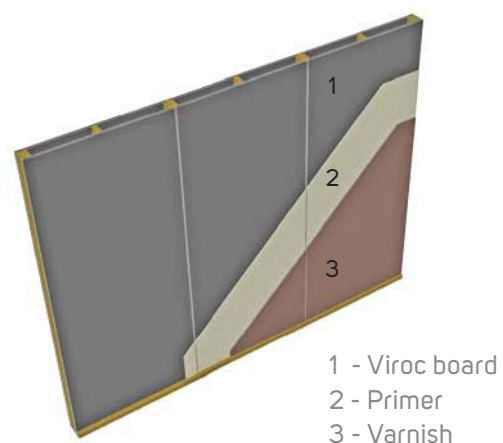
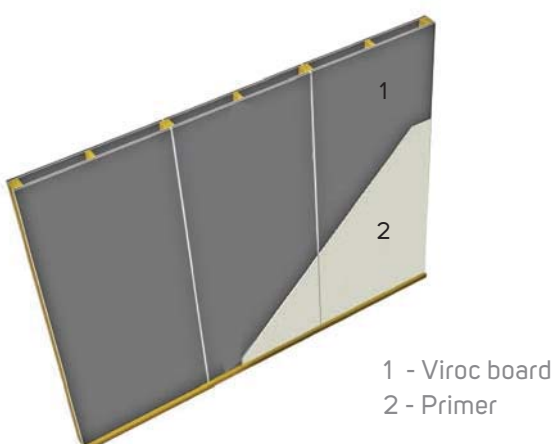
Varnishes are easy to apply on the whole, but it is very important to note that the application must be continuous and steady, to ensure a uniform finish over the board and that the surface does not get stained with different shades.

The varnish application procedure provided by the respective manufacturer must always be complied with. We recommend, therefore, that the technical information and application instructions are obtained directly from the manufacturer.

The varnishes suitable for use on Viroc boards are solvent based acrylic varnishes that are generally suitable for application on concrete.

The application of a varnish on Viroc boards must be tested by performing cyclical accelerated ageing tests, according to the EN 927-6 standard using UV A 340 lamps and with a duration of 12 cycles each of 1 week, totalling 2016 hours.

The following characteristics should be evaluated after testing: fading, loss of gloss, yellowing, cracking, efflorescence, blistering and chalking.



Painting

The painting of Viroc boards may have a decorative purpose, and it will always provide protection against attack by environmental elements.

Before applying paint, the panel surfaces must be completely clean and dry, free from grease, dust or surface salts. The surface should be cleaned by polishing with a cleaning disc or sanding with very fine sandpaper.

The paint should always be applied over a primer that stabilises the surface and serves to fill holes, providing adhesion and ensuring the paint is compatible with the surface of the board.

We recommend a test be performed on a small section before application to test the number of coats required to obtain the intended effect.

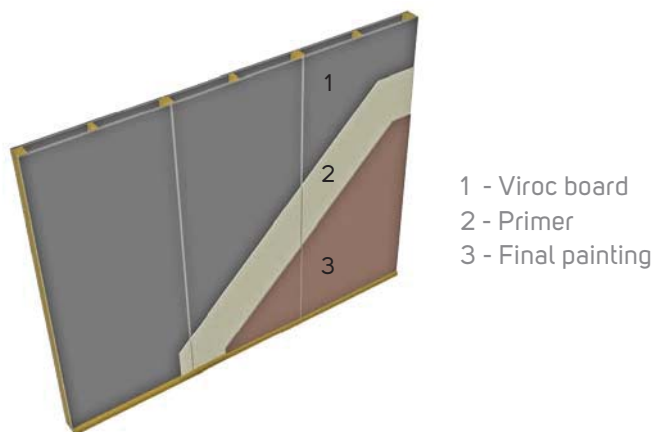
The application must be continuous and steady, to ensure a uniform finish over the board and that the surface does not get stained with different shades.

The paint application procedure provided by the respective manufacturer must always be complied with. We recommend, therefore, that the technical information and application instructions are obtained directly from the manufacturer.

The paints suitable for use on Viroc boards are solvent based acrylic paints that are usually suitable for use on concrete.

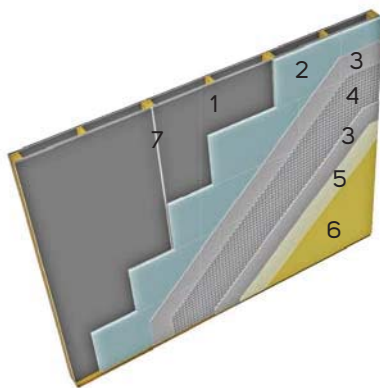
The application of paint on Viroc boards must be tested by performing cyclical accelerated ageing tests, according to the EN927-6 standard using UV A 340 lamps and with a duration of 12 cycles each of 1 week, totalling 2016 hours.

The following characteristics should be evaluated after testing: fading, loss of gloss, yellowing, cracking, efflorescence, blistering and chalking.



External Thermal Insulation Composite System (ETICS)

The external thermal insulation composite system is a method of insulating buildings where expanded polystyrene boards are installed externally. The plates are covered and strengthened with adhesive, reinforced with a glass fibre network to protect the system. The surface is finished with a final continuous coat, which gives the final protection and required permanent decoration, identical to a traditional building.

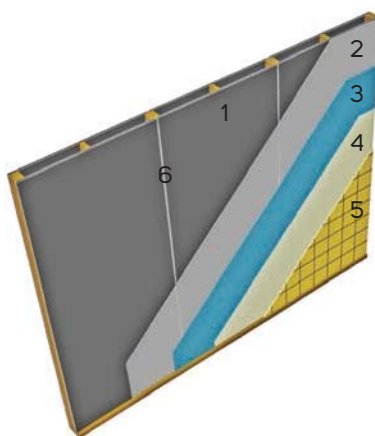


- 1 - Viroc board
- 2 - Expanded polystyrene board
- 3 - Adhesive mass
- 4 - Glass fiber net
- 5 - Water-based primer
- 6 - Final plastic coating
- 7 - Dilatation joints (5mm) with elastic mastic filling

Ceramic coating

The ceramic coating should always be applied over the board with a primer applied to the 6 faces before installation. The tiles are attached to the board with flexible adhesive products, which must be pasted to cover the entire contact surface and not just sporadically.

The ceramic joints should coincide with the boards' joints.



- 1 - Viroc board
- 2 - Primer
- 3 - Insulating hidromass painting
- 4 - Flexible adhesive cement
- 5 - Ceramic tiles
- 6 - Dilatation joints (5mm) with elastic mastic filling

3.3 Joints

The joints between boards must always be manifest, with a minimum spacing of 5 mm that can be filled or not. If filled, a top quality polyurethane, MS polymer or hybrid elastomer mastic should be used. A primer should be applied on the board to enhance mastic adherence.

3.4 Fastening systems

Nailing

Nailing is one of the methods that exist for fastening the board to the substrate. It is used only for fastening on wood structures, in indoor applications.

Several types of nails can be used such as flat head nails in stainless or galvanized steel, standard, threaded or twisted, plastic-coated or not according to the support.

The diameter should vary between 1 and 2 mm and the nail must be 3 to 4 times longer than the thickness of the board.

Nailing must be performed using a previously calibrated pneumatic gun.

Bonding

The board can be fastened using a bonding system on metal and wooden support structures. It may be used as an accessory to mechanical fastening.

The bonding system is generally comprised of an adhesive (polyurethane, MS polymer or hybrid mastic), a double-sided adhesive tape and a set of primers to be painted on the structure and the Viroc board to promote adherence.

The manufacturer of the system should always be consulted to ensure all constraints and specifications are complied with.

Viroc, SA does not recommend the use of bonded systems outdoors. In countries with specific legislation, these systems are not permitted due to their bad fire performance.

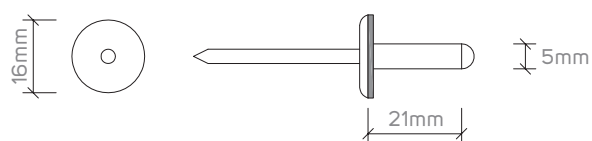
Screwing

The most common system for attaching Viroc boards is by means of screws, due to the ease of implementation and efficiency.

The support structure may be metal or wood. Due to the similarity of the performance of the materials, the use of the wood structure is more suitable.

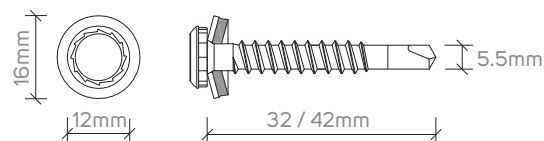
When applied outdoors, Viroc boards undergo dimensional changes from sun exposure, and differences in relative humidity of the air. For this reason the use of screws with an external head associated with a drill hole in the plate that is greater in diameter than the screw is recommended, allowing expansion and contraction to occur without generating any stresses. The type of screw to be used outdoors should be stainless steel.

Outdoor fastening elements



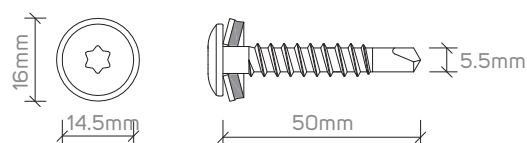
Metallic structure

Rivet C16-W16-5x21 - Viroc 12mm
Head diameter - 16mm



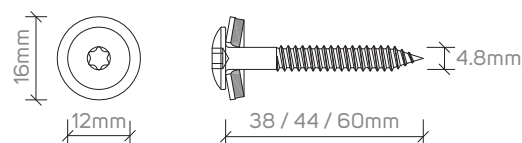
Metallic structure

Screw EMET V12-A16-5.5x32 - Viroc 12mm
Screw EMET V12-A16-5.5x42 - Viroc 16mm
Washer diameter - 16mm



Metallic structure

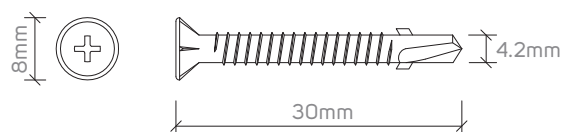
Screw EMET C14-A16-5.5x50 - Viroc 12 and 16mm
Washer diameter - 16mm



Wood structure

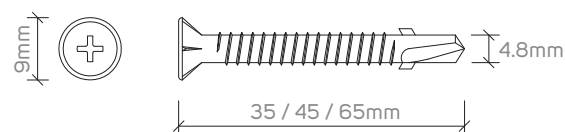
Screw EMAD C12-A16-4.8x38 - Viroc 12mm
Screw EMAD C12-A16-4.8x44 - Viroc 12 and 16mm
Screw EMAD C12-A16-4.8x60 - Viroc 16mm
Washer diameter - 16mm

Indoor fastening elements



Metallic structure

Screw IMET C8-4.2x30 - Viroc 8 to 16mm
Metallic structure - 0.7 to 2mm
Head diameter - 8mm



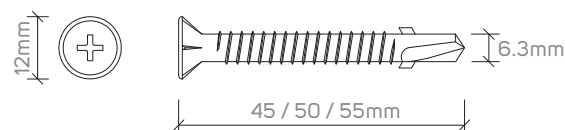
Metallic structure

Screw IMET C9-4.8x35 - Viroc 8 to 19mm
Screw IMET C9-4.8x45 - Viroc 22 to 28mm
Screw IMET C9-4.8x65 - Viroc 32mm
Metallic structure - 2 to 3mm
Head diameter - 9mm



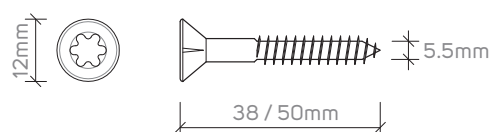
Metallic structure

Screw IMET C12-5.5x38 - Viroc 8 to 19mm
Screw IMET C12-5.5x45 - Viroc 22 to 25mm
Screw IMET C12-5.5x55 - Viroc 28 to 32mm
Metallic structure - 2 to 5mm
Head diameter - 12mm



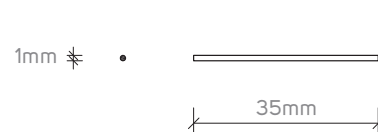
Metallic structure

Screw IMET C12-6.3x45 - Viroc 8 to 22mm
Screw IMET C12-6.3x50 - Viroc 25 to 28mm
Screw IMET C12-6.3x55 - Viroc 32mm
Metallic structure - 3 to 6mm
Head diameter - 12mm



Wood structure

Screw IMAD C12-5.5x38 - Viroc 8 to 16mm
Screw IMAD C12-5.5x50 - Viroc 19 to 32mm
Head diameter - 12mm



Wood structure

Nail 1x35 - Viroc 10 to 12mm

4. APPLICATIONS

4.1 Facades

The Viroc board can be applied outdoors, in particular on ventilated facades. It is the ideal solution for outdoor coverings due to its irrefutable thermal insulation advantages.

The minimum thickness of boards for use on facades is 12mm.

Protecting the board by applying paint or varnish is recommended.

4.2 Partition walls and walls cladding

The Viroc board is also appropriate for use in the construction of partition walls.

When applied outdoors, the ventilated facade system rules must be respected.

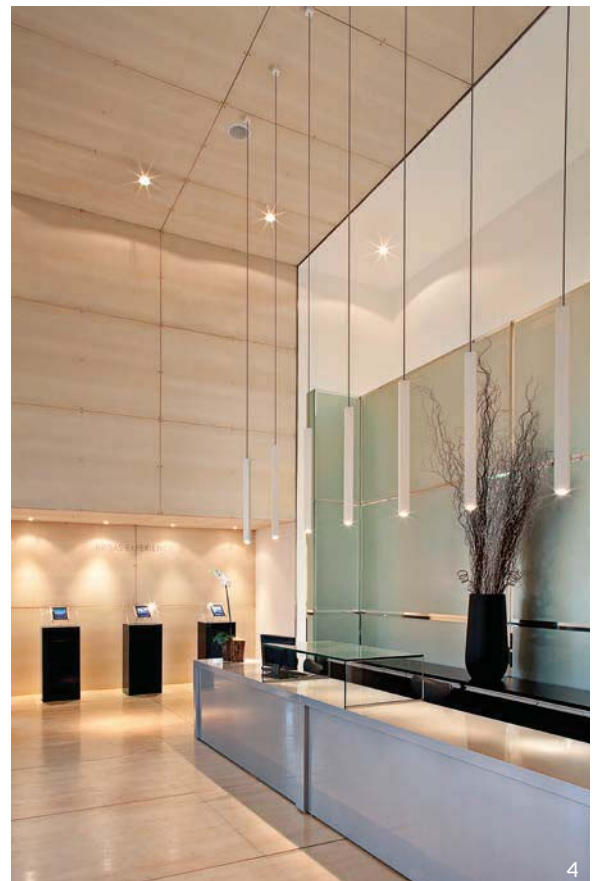
Such an application is enhanced by the board's features with respect to its visual appearance, mechanical strength, sound insulation, fire resistance and durability.

It is the preferred choice for hotel rooms or cinema theatres, where acoustic resistance to airborne sounds and fire resistance are the criteria that define the space to be partitioned. Viroc boards are also ideal for use in damp indoor areas because of the boards' moisture resistance, such as the use in swimming pool complexes, changing rooms and bathroom facilities.

Viroc boards can also be used as a covering and finishing of existing walls, both indoors and outdoors.

The minimum thickness of Viroc boards used on indoor walls in dry areas is 10 mm and it is 12mm for use in indoor or outdoor damp areas.

Paint or varnish coatings are recommended in damp areas.





5



7



3



2

4.3 Flooring

The construction of structural floors or the covering of floors is another possible use for Viroc boards.

It is widely used in the refurbishment of old buildings to replace traditional wooden floors, which degrade in the presence of water in the bathroom and kitchen areas and in the areas where floors are connected to the facade.

It can be used as a covering and finishing of existing floors.

The minimum thickness of boards used on structural floors is 18 mm.

When used as covering, without any structural function and laid on an existing surface, the recommended thickness is 10 mm.

When applied on floors, the loads that the Viroc board will have to bear must be taken into account, because its resistance depends on board thickness and the distance between support beams.

Paint or varnish coatings with good wear resistance should be applied to Viroc boards used as flooring.

4.4 Suspended ceilings

Viroc boards are also used in suspended ceilings, both indoors and outdoors, due to its aesthetics and durability.

The suspended ceilings should possess open joints between the boards, both indoors and outdoors. The minimum thickness of the Viroc boards for use in indoor ceilings in dry areas is 10 mm and it is 12mm for damp areas, whether indoors or outdoors.

Paint or varnish coatings are recommended in damp areas.

4.5 Roof supports

The Viroc board is a suitable material to support roof coverings owing to its mechanical strength, airborne sound insulation rating, heat resistance and moisture resistance.

It is necessary to take into account the loads that the Viroc board will have to bear, just like as when it is installed on floors.

The minimum thickness of the Viroc boards used in roofing is 16 mm.

4.6 Lost formwork

The strength and durability of the Viroc board make it an excellent performing product for lost formwork. In order to minimize waste, the board must be cut crosswise along its longest dimension, forming boards with a width of 1250 mm and the intended length.

The width of lost formwork boards is determined by the spacing between beams, whether metallic or reinforced concrete, plus 4 cm on each side, which is the minimum width for support on the beams.

4.7 Interior design

Recognized for its versatility, Viroc is also used in furniture, stairs, partitions, doors, countertops and other decorative and architectural elements.

Possibilities are endless.



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- 1 Project: Homotech store
Product: Grey Viroc
Application: Facades and interior walls
Architecture: Roberto Pamplona
Location: Fortaleza, Brazil
- 2 Project: Coffee Shop Parque Anjos
Product: Grey Viroc
Application: Facades
Architecture: Entreplanos
Location: Algés, Portugal
- 3 Project: Kindergarten
Product: Viroc Black
Applied on: Facades
Architecture: Nadir Bonaccorso (coordinator), Sónia Silva
Photography: FG + SG
Location: Portugal
- 4 Project: Odebrecht showroom
Product: Viroc White
Applied on: Facades, walls, flooring and ceiling
Architecture: Márcio Corrêa, Atelier Dupla Arquitetura Estratégica
Photography: Haruo Mikami
Location: Brazil
- 5 Project: Peniche Surfing High Performance Centre
Product: Viroc
Application: Facades
Architecture: Adérito Carvalho, Transversal - Atelier de Arquitectura e Design
Photography: João Rosado and Transversal - Atelier de Arquitectura e Design
Location: Portugal
- 6 Project: Shelf House
Product: Viroc Black
Application: Facades and Walls
Architecture: Daniel Capela Duarte, Atelier Mutant - Architecture & Design
Photograph: Daniel Capela Duarte
Location: Portugal
- 7 Project: Lisbon Terrace
Product: Viroc Grey
Application: Flooring and outdoor furniture
Architecture: Ana Guerra
Photography: FG + SG
Location: Portugal
- 8 Project: Modular house, Atelier MYCC, Spain
Product: Viroc Grey
Application: Roofs and facades
Architecture: Carmina Casajuana, Beatriz G. Casares and Marcos González, Atelier MYCC
Photography: FG + SG
Location: Spain

