

# **Natural Slate**

=

121

u

11

н

....

н

п

哥

13

11

П

12

.

Ŧ

Ξ

п

П

I INIMANUT II

Constant of the

п

m/m

H

н

н

-

11

=

Ê.

W

11

11



CUPA PIZARRAS	P. 3
NATURAL SLATE	P. 4
PRODUCTION PROCESS OF NATURAL SLATE	P. 6
ECOLOGY	P. 8
RANGE OF PRODUCTS	P. 11
SELECTIONS AND QUALITY	P. 12
HOW TO CHOOSE A HIGH QUALITY SLATE?	P. 14
CASE STUDIES	P. 16
THERMOSLATE®	P. 18
	P. 20
HEAVY 3	P. 22
CASE STUDIES	P. 24
CUPA PIZARRAS SUPPORT	P. 26



# CUPA PIZARRAS, THE WORLD LEADER IN NATURAL SLATE

CUPA PIZARRAS leads the world in slate production. Our 16 quarries and 22 processing plants combine the latest technology with our traditional know-how and craftsmanship.





# LEADER

One out of three slates for roofing and covering facades in the world have our name written on them. Thousands of architects, professional roofers and private home owners rely on our natural slate to make all of their projects a reality.

More than 98% of our production is exported to more than 60 countries throughout five continents. We also have branch offices in France, the United Kingdom, the three Benelux countries, Denmark and the United States of America.



# **CUP/**4PIZARRAS



# WORLDWIDE



# NATURAL SLATE

We have been producing and commercializing slate since 1892. We have over 125 years of experience in this area and a team of over 1500 associates made up of experts who are passionate about natural slate.

# NATURAL SLATE







Each slate is unique. Its texture tells us the story. Created by all the natural forces and made up of many different minerals. No other artificial alternatives could compare with a product which has been molded by nature for over 500 million years.

#### Durability 11

With a durability of over 100 years, natural slate is the most resistant material used for roofing. Unlike the artificial products, the colour and the properties of slate stay, unalterable, through time with no need of maintenance.

# Sustainability

By being 100% natural, slate is the roofing material with less environmental impact. Each slate is handcrafted by our skilled splitting craftsmen with no chemical products or additional treatments added.



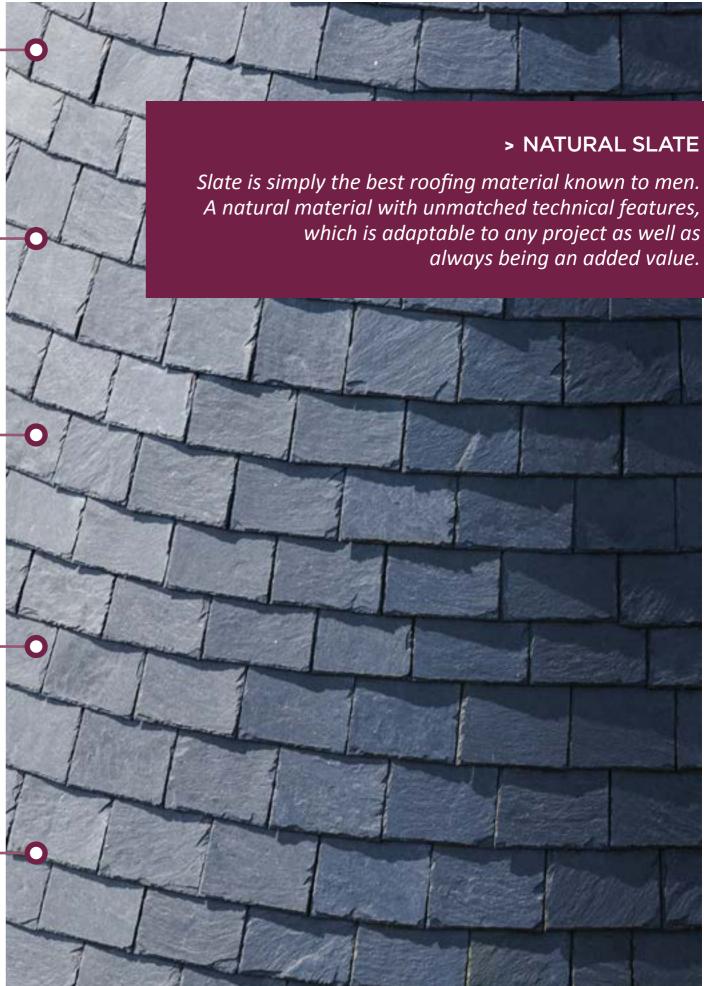


#### Performance

Slate is capable of enduring extreme temperatures, difficult snow formation, fire-resistance as well as being fully waterproof. Only natural slate guarantees a perfect performance in any weather condition.



Slate has endured the test of time. Its unparalleled character and durability makes this material ideal to preserve the aesthetics appearance and personality of any architectural project.



# **PRODUCTION PROCESS OF NATURAL SLATE**

The production process of slate is completely natural:

combining the highest technology with the traditional know how by our skilled handcrafters.





## **1. GEOLOGICAL STUDIES**

Before initiating the extraction, studies are made on the potential of the deposit reserves by taking a sounding. This is done to identify the quality of the slate.



#### **3. TRANSFORMATION**

Once in the transformation warehouse factory, our production team examines each slate block and classifies it by their potential.

SAWED OFF. These blocks will be sawed into different sizes depending on the dimensions of the slate which will be produced.
HAND CUT. The skilled "splitters" exfoliate the slate into thin layers. This handcrafted and meticulous technique allows the finished product to be of great quality.

• **BEVELLED**. The edges of each piece are beveled by a machine in order to make them into the exact size which has been required and thus giving it a characteristic finish.



# CUP/4PIZARRAS



### 2. EXTRACTION

Slate is extracted in huge blocks which are later diamond wire sawed into smaller blocks. These smaller blocks are transported by trucks to the transformation warehouse factory located within the quarry.



# 4. SELECTION

Each slate is inspected by a manual selection process carried out by our quality control department. Both technical and aesthetic control criteria are taken into account here.



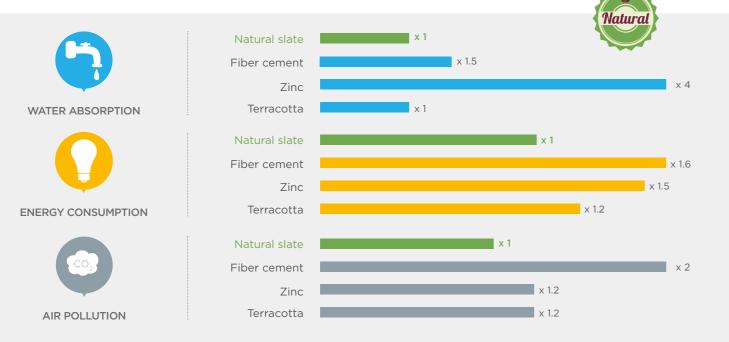
# 5. PACKAGING

The finished slate pieces are counted and packaged in wooden crates. As part of our tracking process, each crate is labelled with all of the technical information of the slate.

# ECOLOGY

CUPA PIZARRAS proudly offers a natural product in the market with the least environmental impact given by other alternatives for roofing and building facades.

The life-cycle analysis, which allows an analysis of environmental impact of a product in a global scale, confirms that natural slate is the best ecological option for any architectural project\*.



\*Life-cycle assessment, studies all the stages of a product's life from production to recycling. Comparison carried out based on the information published by the Britain database Green Book Live on September 2014: http://www.greenbooklive.com/search/advancedsearch.jsp



## OUR ENVIRONMENTAL POLICY

Our environmental commitment becomes evident through the optimization of the production process as well as the creation of innovative solutions focused on the reduction of energy consumption and carbon emissions.



CUPA PIZARRAS counts with the ISO 14001 certification which reflects its plan to protect the environment.



CUPA PIZARRAS is fully committed to improving the production process. This is done through the environmental statement for the construction products.



FDES are standardized documents which analyze the life-cycle of our products and also certify their low environmental impact.

# **CUP/**4PIZARRAS



The production process of natural slate requires a certain level of humidity. In order to reduce the consumption of water, closed circuits have been created and thus allowing the reuse of it.



Our rehabilitation actions of the quarries by means of hydro seeding autochthonous plants secure the recovery of the local flora and wildlife.



More than 60% of the production is transported by ship. This means of transportation is cleaner and more efficient and thus further reducing carbon emissions.

# Choose CUPA PIZARRAS natural slate, the sustainable roofing product.

11

T

=

II

-11

# OUR NATURAL SLATE RANGE: COVERING THE WORLD

Our slate covers more than 200 roofs per day, in every corner of the globe.

CUPA PIZARRAS natural slate is the product of choice for thousands of architects and roofers, and covers some of the most iconic buildings around the world.



# WE OFFER THE MOST COMPLETE RANGE OF PRODUCTS

CUPA PIZARRAS has been producing the most complete range of natural slate for roofing and facade since 1892.

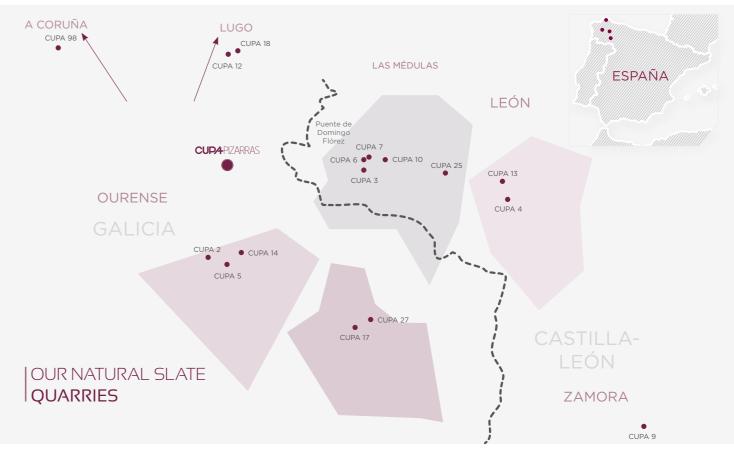
#### MODELS



\* Rectangular is the most common model in the UK.

\* CUPA PIZARRAS promotes 4 of its 16 natural slates for the UK Market.

\* Slate is a 100% natural product, slight colour variations may exist.



# **CUP/**4PIZARRAS

#### SIZES

From 27 x 18 to 60 x 30 cm\*.

\*CUPA PIZARRAS produces more than 40,000 combinations of natural slate models, sizes and shapes.

#### OUR SLATE RANGE FOR THE UK\*



**CUPA 2** Dark grey slate with thin laminations and a smooth surface. Origin: Carballeda de Valdeorras, Ourense.



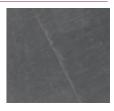
HEAVY 3 Blue black slate with non rusting metallic particles and thin laminations. Origin: San Pedro, León.



**CUPA 5** Dark grey slate with a riven surface. Origin: Pusmazán, Ourense.



Contact us to know our complete natural slate range.



CUPA 12 Dark grey slate with thin laminations and a smooth surface. Origin: Folgoso do Courel, Lugo.

# SELECTIONS AND QUALITY

#### **SELECTIONS**

Throughout the manual selection process, the slate is classified in four different selections:



# **R EXCELLENCE**

This is an extraordinary rigorous classification process which only pieces with high flatness and very regular thickness could pass.

This is considered to be the best natural slate produced in the world. Moreover, it is ideal for projects where a homogenous result for a perfect roof is demanded.



It's characterized by its high quality and only admitting slight differences in the flatness and thickness of the piece.

These are slate pieces chosen by expert installers who are capable of fitting the product to make a homogenous roof.



This selection is made up of slates that allow greater variations in thickness and flatness. The technical characteristics of the slates are the same as in the superior selections, as they are produced from the same natural slate blocks.

The NATURAL selection competes on cost with artificial products, but keeps the long life expectancy and low environmental impact that characterises natural slate.



It's made up exclusively of thick slates, of over 7 millimetres, characterised by their exceptional durability in any circumstance or climatic conditions.

The result is a slate with a crafted appearance and unmatchable strength that gives a roof a unique personality.

## **OUALITY**

CUPA PIZARRAS are a pioneer in establishing the control, analysis and selection systems of natural slate since 1892.

An exhaustive control throughout the entire process allows a range of natural slate which exceeds in all of the quality standards in an international level.





#### PRODUCT TRACEABILITY

CUPA PIZARRAS has a one-of-a-kind integral system of quality control which permits to identify the origin, typology, technical facts and the date of the production of each of the natural slate.

Our product traceability is implemented with a unique barcode that is part of the slate throughout the whole production process.



This product traceability allows the slate to be monitored all through its process, from the quarry to the customer. This guarantees our distinctive value and quality.











**AENOR 9001** 



AENOR 14002

# HOW TO CHOOSE A HIGH QUALITY SLATE?

A high quality natural slate is an unbeatable product for any project.

However, products, which vary in composition and quality and therefore giving it a very diverse performance, are being sold in the market. Necessary conditions needed for a high quality slate:



#### 1. THE QUARRY'S REPUTATION

The slate characteristics depend on where it has been extracted. This is why it is imperative to validate the reputation from both the quarry and the company which produces it.

> CUPA PIZARRAS has been producing natural slate since 1892. We are the number one producer, worldwide of natural slate. The prestige and reputation of our quarries has been confirmed thus making us the leader in the sector.

# 2. TECTONIC SLATE

Not all slates are all alike nor do they offer the same guarantees. Slate produced in Spain, unlike slate from other parts of the world, is of tectonic origin. Recognized worldwide for its performance.

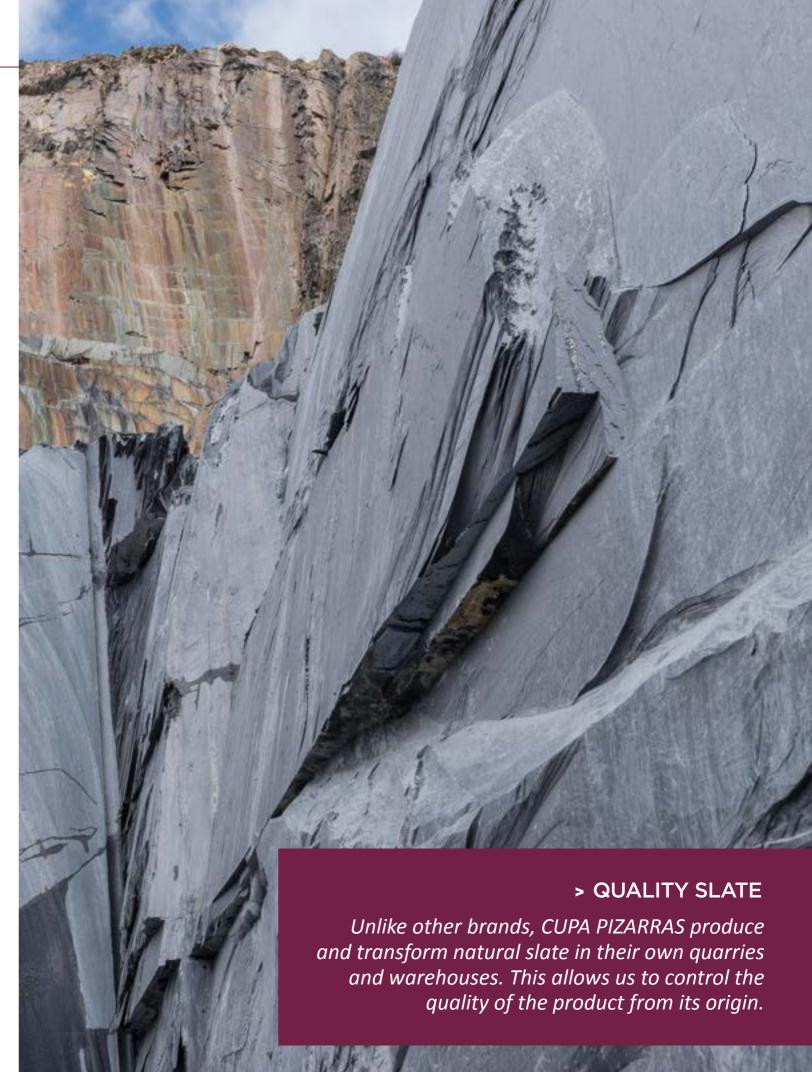
> All CUPA PIZARRAS slate is extracted from the best quarries in Galicia and in Castilla y León, Spain. Here we have the biggest tectonics natural slate reserves in the world.



## **3. RECENT RESEARCH AND** CERTIFICATIONS

It is vital to demand updated documentation from the producer which demonstrates the performance of the natural slate. Producers shall draw up declaration of performance in accordance with its identification: T1, A1, S1 and W1.

> All natural slate produced in CUPA PI-ZARRAS has an updated declaration of performance available and revised constantly by the most prestigious international certifications.



# **CASE STUDIES**

# **CUPA 12. EASTON SQUARE,** ESSEX.

Easton Square, an exclusive development of four bespoke, luxury 6-bedroom houses, features CUPA 12 roofing slates. The product was selected for its superior qualities including its adaptability, longevity and polished finish.

Commenting on the choice of CUPA 12 slate for Easton Square, Jonathan Arksey, at BRP Architects said: 'Our aim was to deliver an uncompromising design to reflect the natural beauty of the homes' surroundings, with excellent quality of build, intricate craftsmanship and superior finishes. CUPA PIZARRAS slate's timeless appearance not only complements all the external materials that make up the dwellings, but is also in harmony with roofing used throughout the neighboring Conservation Area of Great Easton.'



"CUPA 12 SLATE IS A HEAVY AND DURABLE MATERIAL WHICH IS NOT ONLY STRAIGHTFORWARD TO WORK WITH. BUT ALSO ALLOWS FOR THE EXTENSIVE COVERAGE REQUIRED TO RE-ACH THE DESIRED QUALITY OF FINISH. ALSO, DUE TO THE DWELLINGS PITCHED ROOFS IT IS IMPORTANT THAT THE MA-TERIALS CAN ADAPT TO THE DEMANDS OF VARYING GRA-DIENT LEVELS, WHICH CUPA 12 SLATE DOES PERFECTLY."

ROBERT CANNON, ROOFING INSTALLERS R AND N ROOFING

# **CUPA 12.** TAIL MILL, MERRIOTT, SOMERSET.

Tail Mill in Merriott, close to Crewkerne in Somerset, has been refurbished and converted along with the construction of new residential properties, built by developer Zero C.

Yeovil based Davey Roofing was the specialist subcontractor which installed thousands of CUPA 12 slates, with RSL in Exeter being the stockist which originally proposed the specification of the product for the prestigious project.

The development involved extensive consultation with English Heritage and the local authority's Conservation Officer, as well as existing residents in the area. Each property has been designed to complement its setting, incorporating traditional styling and character features typical of the area, with a combination of local natural stone and timber cladding beneath the mainly slate roofs.





# CUPA 5. MARSHALL'S YARD, GAINSBOROUGH.

Founded in 1848, this shopping centre is located in Gainsborough (Lincolnshire). It has been recently transformed into a modern commercial, leisure and business complex to serve the needs of the local community.

The first phase of the development opened in April 2007 with Burton Roofing Merchants at Leeds providing the 5,000 square meters of CUPA 5 slate. Project completion was in the summer of 2007 with a further 500 square meters of CUPA 5 and 30.000 more natural slates used at the end.

"WE ALWAYS TRY TO USE CUPA PIZA-RRAS NATURAL SLATE ON ANY OPEN SPECIFICATION PROJECT BECAUSE THEY ARE HIGH QUALITY AND COMPE-TITIVELY PRICED. WE ARE PROUD TO HAVE PLAYED A SIGNIFICANT ROLE IN THE DEVELOPMENT OF MARSHALL'S YARD AND LOOK FORWARD TO WOR-KING WITH CUPA PIZARRAS ON MORE PROJECTS."

MARK SMITH. MARK SMITH ROOFING

# CUPA 2. **BELGRAVE PLACE,** SEAFORD, SUSSEX.

This luxury development is located in Seaford, East Sussex, and its design keeps many of the original architectural features of the area.

Around 80,000 CUPA 12 slates were used for the project, giving an exclusive distinguishing touch.

Project roofing contractors Simmons Roofing Ltd, are no strangers to natural slate and have laid 500,000 CUPA PIZARRAS slates over a period of four years on a number of projects.

"CUPA PIZARRAS SLATES ARE OUR FIRST CHOICE FOR ANY PROJECT DUE TO THEIR COMPETITIVE PRICE AND CONSISTENT QUALITY, WHICH REDU-CES THE TIME WE WOULD NORMALLY SPEND SORTING THE SLATE BEFO-RE LAYING. IT WAS OUR RECOMMEN-DATION TO THE DEVELOPERS THAT CUPA 12 SLATES BE USED FOR BEL-**GRAVE PLACE."** 

PAUL FARRIER, MANAGING DIRECTOR





# **CUP/**4PI7ARRAS



"THERE WERE A NUMBER OF REASONS FOR PUTTING FORWARD THE CUPA 12 SLATE TO THE CUSTOMER. IT WAS A JOB WHERE QUALITY AND LONGEVITY WERE PARAMOUNT AND WE KNOW THAT IS ALWAYS CERTAIN WITH CUPA PIZA-RRAS, WITH THE CUPA 12 SLATE R EXCELLENCE SELECTION OFFERING A 100 YEARS' GUARANTEE."

LEE HOUSE, THE BRANCH MANAGER FOR RSL IN EXETER



# thermoslate

THERMOSLATE thermal panel system is one of a kind in the market which uses natural slate to transform solar light into energy. This is later used for heating, hot water or to heat swimming pools.

Because of its modular design, THERMOSLATE is integrated in a quick and easy way to create a natural slate roof.



Efficient Up to 2/3 of annual needs for hot water



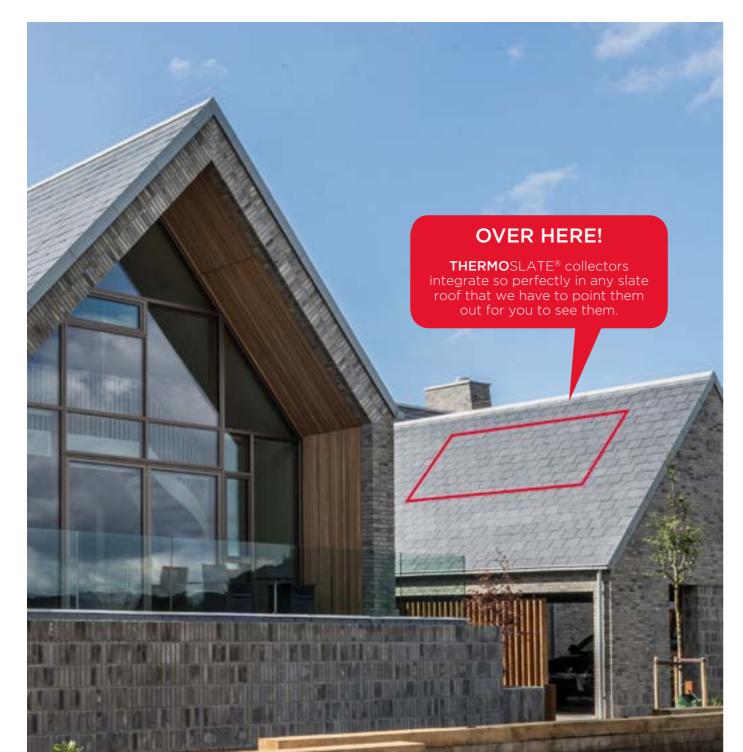
Compatible With any storage and distribution system



**Energy saver** For domestic hot water and pool heating



Invisible Full integration into any roof or cladding



# CUTTING-EDGE TECHNOLOGY IN YOUR NATURAL SLATE ROOF



#### **Light and robust**

Weighing just 20kg/m<sup>2</sup>, THERMOSLATE<sup>®</sup> is highly robust. This solar collector has been developed to be installed on any construction system.



#### **Inspired by nature**

The veins on the backs of tree leaves inspire the most efficient known energy absorption and fluid distribution system, which the THERMOSLATE® collector incorporate.

#### DIFFERENT SYSTEMS FOR A SEAMLESS INTEGRATION

1. System with nail

#### 2. System with hook





#### **CERTIFIED QUALITY**

AENOR R







# **CUP/**4PIZARRAS



# 100% Waterproof

A specific waterproofing kit certified by the CSTB, assures the total evacuation of water on the integration areas on slopes of over 15º.



# **Efficiency and safety**

Maximum energy efficiency with a maximum operating temperature of 95 °C, thanks to the properties of natural slate.

3. Technical solar floor





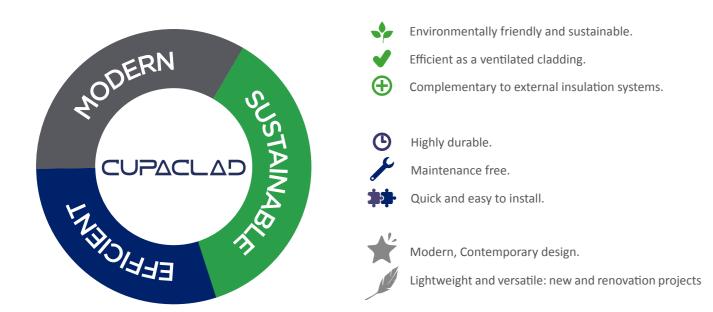




# 

The new system CUPACLAD<sup>®</sup> has revolutionized slate installation on a facade. This system was developed with the cooperation from Danish architects and installers.

The use of high durability tectonic slate, innovative fastening, and the efficiency of the rain screen cladding make CUPACLAD<sup>®</sup> an extremely competitive and sustainable alternative for cladding any facade.





#### **SERIES 101**

CUPACLAD is characterized by the fastening system. These fasteners ensure an optimal installation on the facade while being completely invisible. The CUPACLAD 101 series system enhance the aesthetic of any wall or surface where installed.

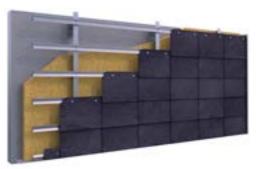
# CUPACLAD 101 Logic | Simple and balanced



# CUPACLAD 101 Random | Dynamic and creative



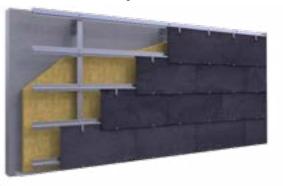
# CUPACLAD 101 Parallel | Uniform and regular



#### SERIES 201

Series 201 uses special visible stainless steel fasteners which combined with the texture of the natural slate gives this cladding a touch of trendiness.

# CUPACLAD 201 Vanguard | Modern and efficient











SLATE HAS BEEN USED AS A ROOFING MATERIAL THROUGHOUT SCOTLAND SINCE THE MIDDLE AGES. QUARRIES WERE LOCATED IN SEVERAL AREAS, OF WHICH THE MOST IMPORTANT WERE:





Easdale and the surrounding Slate Islands south of Oban.

Ballachulish, near the southern end of the Great Glen.

Highland Boundary: a series of quarries on a line from Arran to Dunkeld.

However, the industry could not compete with tiles and imported slate and all the Scottish quarries closed between 1955 and the 1960s.

In the absence of quality Scottish slate, Heavy 3 became the perfect choice for traditional slate roofs.



Heavy 3 slate is quarried from the CUPA PIZARRAS N°3 quarry in San Pedro de Trones (León) in northern Spain. This quarry has been in operation since 1892 and produces around 25,000 tonnes each year.

The slate is dark-grey with a slightly gritty texture, and in some samples well defined parallel lines are clearly visible on the cleavage surfaces.

Another obvious feature of the slate is the presence of metallic cubes approximately 2mm in size. Sometimes these cubes are randomly distributed throughout the slate, while in other cases they are concentrated in discrete bedding layers. These cubes are of iron sulphide, known as pyrite.



- Slate from San Pedro quarry is produced in two thicknesses, 3.5mm and 7-8mm; the thicker variant being the preferred choice in Scotland.
- The extra thickness and weight give it strength to withstand the high wind speeds and driving rain common throughout Scotland.
- No slate is a true match for Ballachulish, the best-known of Scottish slates. However there are many similarities between Ballachulish and our Heavy 3.
- Both are blue-grey in colour and have similar thickness, and pyrite crystals are usually present in both. In the absence of a new source of Scottish slate, Heavy 3 is the best choice for repair and replacement of traditional roofs in Scotland.

# **CASE STUDIES**

# THERMOSLATE®. **PRIVATE HOME IN** GAILLAGOS, FRANCE.

This dwelling is located in a unique natural environment in the French Pyrenees (Gaillagos, France).

When designing this family home, the main focus of the owners was to reduce their energy consumption without giving up to an elegant traditional slate roof. That is why they decided to get THERMOSLATE® installed: it is a completely invisible solar roof that gets repaid from day one.

Only 4 collectors installed on a total surface of 5 m<sup>2</sup> were enough to cover more than 60% of their hot water needs (250 liters per day). Regarding their energy consumption, this family got to save up to 2,854.2 kWh every year! Besides the energy savings, this solar roofing gets to reduce the environmental impact by avoiding the emission of more than 1,900 kg of CO, per year.

This solar thermal system was installed and fully integrated into the CUPA 10 Excellence natural slate roof (format 32x22 and 3.75 mm thick), ensuring a perfect look without unsightly panels standing out.



"WE WANTED IT TO BE SOMETHING LIKE A SUNDIAL. SO THE CHANGES IN WEATHER AND THE MOVEMENT OF THE SUN CAN BE EXPRESSED ACROSS THE BUILDING. THE NATURAL SLATE CLADDING. WITH TINY STAINLESS STEEL CLIPS CATCHING THE LIGHT AT CERTAIN ANGLES, WAS THE PERFECT SOLUTION TO EXPRESS THE TIME OF DAY WITH SHADOWS."

CASPAR RODGERS, ALMA-NAC ARCHITECTS





# **HEAVY 3. RENFREW TOWN** HALL, GLASGOW.

Renfrew is a small Scottish town located 6 miles west of Glasgow, in a strategic area of Scotland, being therefore the scene of numerous military confrontations. That's why its architecture oozes centuries of history.

Located downtown Renfrew, the Town Hall is an impressive 19th-century building. Its tower rises to more than 100 feet, a symbol of the civic pride evident in Renfrew during its industrial heyday.

In 2012, The Renfrew Town Hall was officially opened as Museum, offering an interactive experience of the story of the town.

As part of a refurbishment programme, The Renfrew Town Hall roof was renewed with Heavy 3 natural slate. Its close likeness to the look and feel of traditional Scottish slate made it the perfect choice as a roofing material.

# **HEAVY 3.** PORTAVADIE MARINA. LOCH FYNE.

Set in a man-made lagoon, situated on Loch Fyne, Portavadie Marina is one of the UK most modern marinas, with deepwater, sheltered berthing and stunning purpose built facilities.

Situated just a few miles to the north of the Isle of Arran, Portavadie Marina is handily positioned amidst the beautiful cruising grounds of Loch Fyne and is ideally located to give access to the Firth of Clyde and some of the finest sailing waters in the world.

Restaurants, bars, accommodation and 230 berths make this destination great for yachters, walkers and families alike.

Loch and Glens architects specified Heavy 3 slate as the perfect choice for this prestigious project, matching the highest standards in terms of aesthetics and functionality.





# **CUP/**4PIZARRAS





# CUPACLAD<sup>®</sup>. SPLIT HOUSE, ESSEX.

Located near Pett in South Essex, this family home combines sustainability with an eye on the future. The house, which has an internal floor area of 400 square metres, was completed in 2014, after a construction period of 18 months.

This private residence standing on a hilltop along the Sussex coastline was built to replace an old, undistinguished bungalow. The aim of Alma-nac architects was to create a building that makes the most of its enviable location in the natural environment, offering 360° views.

The upper level of the Split House features CUPA-CLAD<sup>®</sup> 201 Vanguard, helping to prevent moisture in while enhancing the contemporary look of the house

The architects also underscored the desire to engage with the environment, and CUPACLAD<sup>®</sup> 201 Vanguard gives it an additional boost to fit into its surroundings.



# CUPA PIZARRAS SUPPORT

Our pledge to high quality of all of our products has earned us the trust of thousands of architects, installers and clients. We are the world leader of natural slate thanks to you, our client.

This website is updated daily to

newest information on our products

More than 1500 professionals make up our team and we are committed to give you the best service available.

# CUPA PIZARRAS UK

 $\bigcirc$ 

Our Edinburgh office could be contacted via telephone or email. Do not hesitate to contact us.

- 45 Moray Place, EDINBURGH
- Email: uk@cupapizarras.com
- Phone: +44 (0) 1312 253 111
- News center

anytime, anywhere.

• Area for professionals

# CUPAPIZARRAS.com Social Media

Our goal is to provide helpful information and listen, learn and engage with our clients. If you have questions we're here to help with that too.

- Twitter: @CUPAPIZARRAS\_en
- Facebook: /CUPAPIZARRAS
  - Linkedin: /company/cupa-pizarras
- Other Social media: Pinterest,
- Google+, Instagram, Youtube



#### SUPPORT FOR ARCHITECTS

• Specifier department: Our slate professionals are at the disposal of architects to organize meetings or visits to our quarries, launch new products and support the entire specification process.

• CPD: CUPA PIZARRAS has partnered with the RIBA CPD Providers Network to create a seminar that covers everything an architect needs to know about natural slate.

Our CPD will run you through the basic characteristics and benefits of Natural Slate and look at its production process, from quarry excavation to roof installation.

#### SUPPORT FOR ROOFERS

• Sales department: Our sales experts are happy to answer any questions and give you the best advice available during the whole process from the selection of the slate to the product installation. Don't hesitate to contact us, we are at your disposal.

• Marketing tools: Our marketing department has created documentation and materials ready for the installers. With a wide range of catalogues with technical information, we are ready to help you with any tool which may be needed.

• Technical support: Our technical support team is made up of skilled professionals who are dedicated to each of our products: Natural Slate, CUPACLAD and THERMOSLATE. It offers the customer a consultancy service where all of your questions will be answered.

We are committed to offering distinctive, innovative specification and solutions to construction industry professionals. That's why we are using the leading specification software to suit all types of built environment needs and sizes.





# CUP/4PIZARRAS

111 Buckingham Palace Road SW1W OSR LONDON Ph. +44 (0)20 3904 3001 uk@cupapizarras.com

# f ♥ ₽ 8+ in CUPAPIZARRAS.COM

Ŧ

1 11

T.

....

Ē.

u

11

11

-

11

11

**HI** 

1

/画/面

/⊡∕Ⅲ

1

펛

8 8

큠

11

П

II

1 11

11

ff

H

18

11

11

11

**m** 

Ŧ

11

TY

Ξ

**D** 

II

11

11

H

11

н

111

1

Ħ

HH

п

I III KARUT II

==

п