

DESIGNING SUSTAINABLE ARCHITECTURE WITH CERAMICS

Javier Sorlí Gellida

Universidad Politécnica de Valencia. Spain

1. NATURAL TRACE

"Cipriano Algor went to the pottery workshop door and began to arrange the statuettes on the ground, standing them upright, firmly in the wet soil, and when he'd put them all in place he went back to the kiln,... and carefully took down the small defective figurines he'd collected from the shelving, and united them with their fault-free, healthy counterparts, who will be turned into mud with the rain, and then into powder when the sun dries them, that being the destiny of each of us"

José Saramago, The Cave

The intention of the Nobel prize-winning Portuguese author's old potter character, after having had to abandon the pottery where he'd spent his whole life working, was to turn those pieces, which had not yet been put into the kiln, back into the prime material form they had once been moulded from. Even the defective pieces stand out. This is a quality of clay which makes it such a hated material by archaeologists, as its traces get lost in the mists of history because, with wear, it reverts to its original state, back into earth clay again; a natural procedure which guarantees the sustainability of this material.

This process of deterioration, slow and drawn out over hundreds of years, does not affect the mechanical characteristics or the durability of fired clay, which is being worked with every day, seeking ways to improve it. Thanks to these qualities, and also supposedly to the concept of sustainability which is so much in vogue nowadays, we are seeing a resurgence in ceramic materials, a certain revival in which ceramics reasserts itself with all its force as a leading player in buildings, definitively rejecting its exclusive applications in interiors and wet areas, and putting itself forward as a chief contributor to the material side of the building, dominating the headlines of newspaper articles because that material is involved.

Naturalness is in fashion, and a material which comes out of the earth, mixes with water, which needs air and hardens on firing, could not pass before the eyes of contemporary architects unnoticed, thus leading to a renaissance in ceramic materials. Rather than being a fashion, we would be talking of a natural process, by which way humans tend to approach nature.

Moreover, this approach to what is natural is not only something physical, but also something conceptual, since numerous examples in recent years have germinated from this relationship between architects, artisans, and industrial technicians to achieve creations of extraordinary sensitivity, which resemble nature and even seem born of it. Bricks and ceramic tiles have freed themselves from their formal straitjackets, have escaped their two-dimensional moulds, and we now have large-sized items and generators of new spaces and even of autonomous forms.

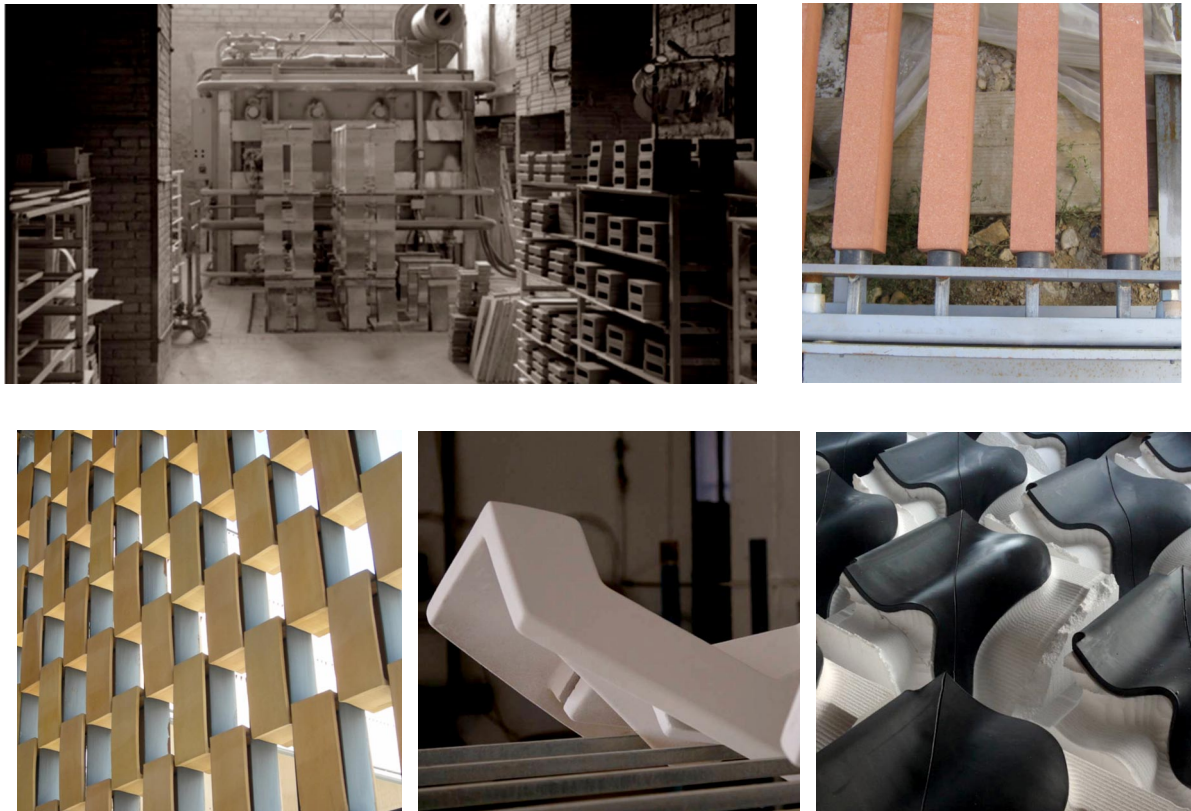


Figure 1.

2. ARCHITECTURAL SUSTAINABILITY WITH CERAMICS

The global concept of sustainability makes reference to the satisfaction of a series of needs of one's own, without compromising the fulfilment of future needs. Thus, when we refer to the term 'sustainable architecture', we should strictly be speaking about being able to use a building here and now, whilst allowing future generations to carry on taking advantage of that building. Nevertheless, it appears more fitting to speak of sustainable architecture, or to demand sustainability of a building by means of the materials it is built of, or of the energy and work it requires in order to achieve optimum use and maintenance levels. For this, the more sustainable the construction materials used to build it are, the more sustainable the building is, and its functioning with renewable energy sources and natural processes is assured.

With regard to ceramics as a sustainable constructive material, we only need to refer to the organic nature of its raw materials to make this affirmation. On the other hand, it is in the production of ceramic items where we must really insist, and that's how things are progressing, as is demonstrated by the R&D+i sections in companies, increasing efficiency and saving resources in industrial processes in order to reduce CO₂ emissions into the atmosphere and to comply with the Kyoto Protocol requirements.

Until now, the use of the word sustainability in the world of construction with ceramics was concentrated in industrial terminology, more focused on trying to contribute standardised global designs, with wide-scale application, than in boosting the value of the materials themselves and their qualities. Ceramics can contribute to improving building energy performance provided that their qualities, performance attributes, and usage from the project design phase onwards, are taken into account. Qualities such as their high aesthetic performance levels, possible finishing options, organic nature, low maintenance costs, easy handling, reusability of pieces, mechanical performance, visual make-up, dry jointing possibilities, together provide a wide-ranging field in which to locate the most suitable items for any project.

As well as thinking about the design of the particular piece, it is vitally important to bear in mind the external environmental conditions surrounding the project in order to use these to full advantage: breezes, vegetation, water, sunlight, shade, adjacent structures, possibilities regarding natural maintenance... To the extent that one manages to control these environmental qualities, and there is a balanced joint action between ceramic usage and project needs, as well as needs of the location itself, project energy efficiency will be achieved, as also will resource optimisation. It is a case of keeping these factors in mind from the outset finally to reach the building finish, using these conditioning factors as drivers to arrive at the solution.

Recent years have witnessed numerous examples of ceramic materials turning into leading players in projects, either because of the use of standardized pieces or the creation of new items which were not previously on the market, which are intended to fill a gap. Collaboration between technicians and artisans has become closer, giving rise to new pieces capable of reinforcing the idea behind a project, at the same time as complying with mechanical and manufacturing requirements.

Preoccupation with, and assessment of, the natural environment has led to an upsurge in interest towards natural materials as well, and to work on the justification of their selection based on biological and climate criteria.

There are many ways of dealing with a project to improve its thermal comfort levels. If what we aspire to is to create shade over a façade, the selection of material such as porcelain tile in the form of sheets will allow a surface to be produced that requires no maintenance, which will give full compositional play, and over which the industry will be able to offer us a material with dimensional stability and colour fastness against such weathering agents as the sun and moisture. The ceramic curtains of buildings such as the Valencian offices of Ruiz-Larrea & Associates or the fish market in Benicarló by Eduardo de Miguel and José María Urcelay are two good examples capable of generating shaded spaces and good ventilation in order to protect their rooms from direct radiation, and in adverse climate conditions by facing south or by being located next to the sea, respectively, and thereby enjoying an intermediate zone with adequate light.

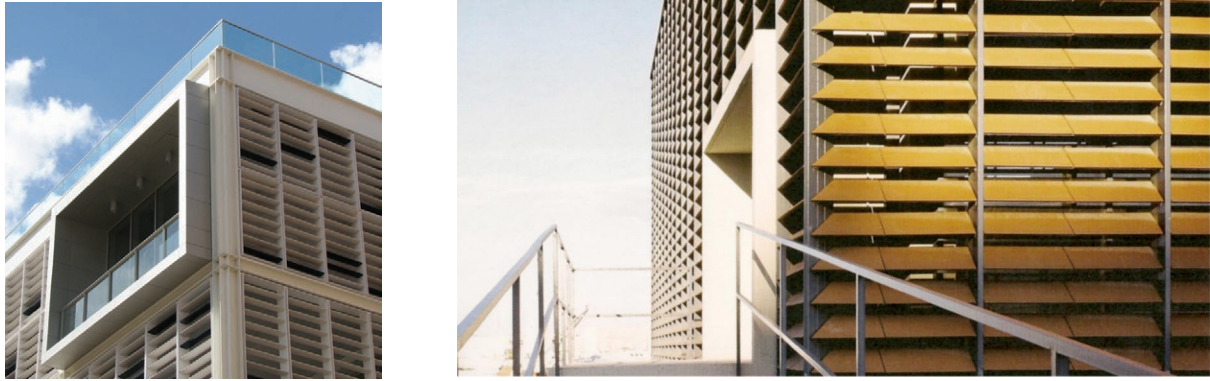


Figure 2.

Without having to expand the repertoire of façade elements but by breaking down the constant game of equally arranged pieces, Felip Pich-Aguilera and Teresa Batlle take advantage of the turn of terracotta to allow the entry of ventilation and illumination to enter at the points they wish, and thus manage to create a compositional rhythm on the façade matching the immediate industrial environment where the building is located.

We can also generate shade with independent façade elements which have their own identity, like the fired clay pieces which form the shaded entrance to the Convention Centre in Peñíscola, by the architects Paredes and Pedrosa, which turned into a point of reference because this was one of the first buildings on which architects worked hand in hand with artisans to find the best solution, some three-dimensional ceramic pieces hanging from a lightweight metallic structure made up of metal strips and rods generating external space which is at the same time internal, which serves as an entrance hall or lobby, and which has become an icon of the building.

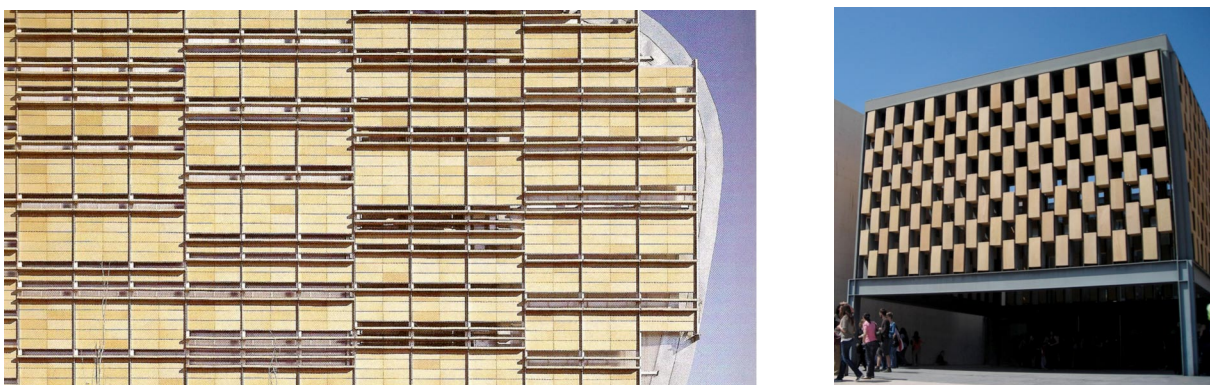


Figure 3.

Originality in a project is always a goal in itself. If we refer to the use of ceramics, it isn't strictly necessary to devise a new piece to be original, as we have been able to see. Just as Gaudí used existing ceramic pieces in an original way, for example in the patio of the Casa Batlló, by combining pieces of different colours to produce a colour gradation, from lightest to darkest in ascending order, thus to achieve a uniform spread of luminosity throughout all the storeys of his building,

he also succeeded in making the most of an already existing product, at the same time as using broken and rejected scraps in the “trencadis”.

But on other occasions, the design of new pieces is a necessity, or at least the adaptation of ones already in existence is, to achieve the realisation of an idea we’ve been carrying around in our heads, such as being able to locate plant elements in the façade, which also contributes to creating a fresher, healthier environment in the place. In the Badalona housing project Toni Gironés takes up this idea of plant ceramic lattice to produce a backdrop which allows him to separate dwelling entrances from the street environment, and to achieve the visual permeability and light control required by that space. These ceramic flowerpot holders are a unit in themselves, but repeating them creates the building’s final form. In addition, they also call for the interaction of the inhabitants to cultivate them and to take on the responsibility for their maintenance, as if it was a vertical garden, or an Andalusian patio.

Weather conditions in the environment can sway the choice of one piece or another. For example, in a constantly rainy environment and an atmosphere heavily charged with moisture, like in the German city of Mainz, the selection of a glass finish for ceramic tiles on façades and coverings for the residential building and social centre as projected by the Italian Fuksas studio, will favour hygienic aspects, building maintenance, and help keep the colouring of the pieces unchanged.

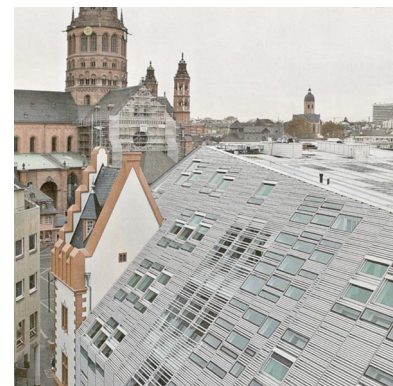


Figure 4.

The use of ceramics as one of the chief material components of a building, together with other materials of plant origin, such as wood, helps to contribute to the perception of the ‘Spanish Pavilion’ at the last Expo 2008 in Zaragoza as a “green” building through its low maintenance requirements and natural ageing qualities. By using terracotta with no cladding, we are getting closer to nature and the vision of buildings as poplar grooves next to the Ebro becomes more evident.

The build-up of tall columns clad in fired clay, their apparent randomness of distribution, the unequal thickness of the columns and the chromatic variety, together with the sheet of water at our feet, literally conveys the sense of walking through a wood, where the breezes generated in this environment are capable of refreshing the atmosphere, thus reducing the temperatures of the Zaragoza

summer by several degrees, and also of filtering the light into the building and infusing it with a certain warmth.

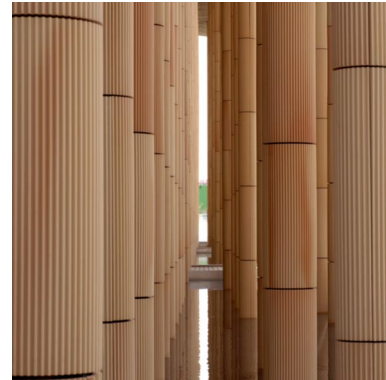


Figure 5.

Sustainability as a concept is undoubtedly one of the most important leitmotifs of our time. When applied to architecture, we are obliged to take into account certain aspects, from raw production materials (the obtaining of which does not produce toxic waste and is energy efficient), the construction techniques which involve minimum environmental deterioration, the location of the building and its environmental impact, and the recycling of used materials when they have reached the end of the project's useful life and the building gets pulled down.

As can be appreciated in the buildings shown, ceramics as a project material can help in the design phase to focus on these bioclimatic aspects. Also, working in tandem with free resources, such as water and air, to achieve valuable architectural effects (reflections, thermal comfort...).

3. COLLABORATION BETWEEN ARCHITECTS AND CRAFTSMEN TO BRING A PROJECT IDEA TO FRUITION. PROCEDURAL SUSTAINABILITY

The use of ceramics, besides complying with certain sustainability requirements, also serves to support the design concept of the building. The possibilities that this material possesses in respect of finishes, treatments, colouring, anchoring possibilities, allow it to be kept in mind at the time of bringing the architectural idea to fruition. There are numerous examples in which the professional cross-field collaboration allows to approach solutions in the factory related to problems which later crop up in the works, which doubtless presupposes a step forward in ecological aspects of presumed material savings. The Spanish ceramic industry has proved this, by supporting, through the Ceramic Manufacturers' Association ASCER, all the architects that go to them with a project idea that needs to be developed so that it can be industrialized. The first step has already been taken, that is, the architect has admitted openly he is not self-sufficient, and that he needs to cooperate with industry and handicraft.

On the roof of the Santa Caterina market in Barcelona by Enric Miralles y Benedetta Tagliabue, the idea of working on a market is carried out with all sensitivity in order to reproduce the colours of the fruit and vegetable stalls in the glaze of hexagonal ceramic pieces that clad it. In this way, with a bird's eye view we can ask ourselves if that roof really exists, or whether we are seeing through it what it is exactly that the building has to offer.

To succeed in bringing that idea to fruition, the collaboration of architects and technicians together with tradesmen like the ceramist Toni Cumella is indispensable in learning craft colouring techniques and to succeed in achieving optimum use of resources when it comes to embarking on so complete a project due to the area to be covered. Without this symbiotic relationship between design and technique, constructing a work of such magnitude would be unthinkable. The undertaking cannot focus solely on the design of autonomous pieces, but rather it must reach all the construction phases: factory warehousing, transport, work stock and tiling. Economically, the hours invested by a technician in devising a new way of wrapping goods, of transportation and the installation of pieces are comparable to the costs of the scrap or wasted material, but from the viewpoint of sustainability we are achieving considerable long-term savings, apart from gaining practical experience and knowledge.



Figure 6.

The involvement of the firm Cerámica Cumella, in this project as well as in other well-known projects such as the Spanish Pavilions at the 2004 Aichi Exhibition and the Zaragoza Exhibition in 2008, or the media Villa Nurbs, have contributed to it being granted the 2009 National Craftsmanship Award due to the integration of technical tradition and procedural innovations.

The Aichi piece stands out for its lively colouring and irregular shape. Despite the fact that at a quick glance, they appear to be perfectly formed hexagonal pieces, there is a deformity which breaks up the monotony of the façade to produce a varied interwoven effect due to the use of six different types of pieces. The project idea is to signal the intention to unify concepts like Mediterranean patio space as an extension of the rooms which empty out into it, with the eastern concept of “engawa”, which refers to the space covered by building eaves and serves as a lead-in to the access to the building. To create these effects, the architects

Alejandro Zaera and Farshid Moussavi use glazed ceramics, common also to the Japanese tradition, producing a lattice which will allow the creation of an open yet covered room, with an enclosed perimeter, surrounding the entire exhibition area. The skill of the architects and designers of this piece, involving an application for a temporary pavilion, lies in their dry-fit system, which means that it has enabled the re-use of some of the 15,000 pieces in other buildings in the city after their disassembly.



Figure 7.

After the success of collaboration proposals such as these, it is entirely to be expected that new challenges and projects should emerge, and that architects immediately turn for help to these people who know the technique, in order to develop their ideas. This was the case of the Spanish Pavilion at the Zaragoza exhibition, in which the architect Francisco Mangado turned to the Association of Ceramists with a clear picture of how the pillar cladding pieces should be, so that he could find out which firms could bring these ideas to fruition. Then the tandem between Cerámica Cumella and Cerámica Decorativa came onto the scene to collaborate alongside the architect from Navarre with the goal of finding an integral solution which simultaneously resolved the problem of the piece and the installation. As the design progressed, joint collaboration was necessary between the different actors involved in the construction to find solutions to the day to day problems, finally leading to a piece capable of achieving all of the project's aims.

The result is a terracotta element which seems to belong to nature through its wide chromatic range, produced by firing the pieces at different temperatures in various layers, with the right groove depth to allow the firing heat to reach the bottom but not to over-fire those areas that stand out from the body, in suitable lengths for easy transportation and in-works handling, with a series of auxiliary elements which guarantee formal stability when the pieces are placed in the kiln,... in short, perfect pieces thanks to the insistence on doing things very well by all involved in their creation. This has entailed a degree of time and effort that is not readily perceived, but in reality they are making full sense of the architectural project, and contributing to the right of some professionals to advance and to carry on learning for future goals and projects. In a certain sense, here we are also talking about sustainability as well.

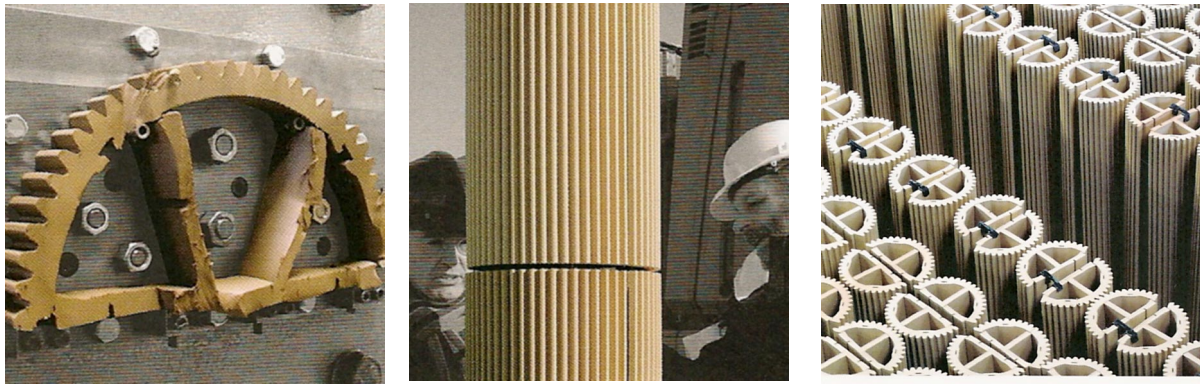


Figure 8.

The architect Enric Ruiz-Geli also believes this, and that is the reason which justifies the time taken to work on the three dimensional pieces which cover the south-facing façade of the Nurbs villa in Empuriabrava. This façade is seen as an energy collector and is opaque in comparison with the north-facing façade, to protect itself climatically. In view of the morphological shape of the building, which is a hybrid between a boat and a car, an organic piece was designed which is capable of creating its own topography to enable it to adapt its shape to the curvature of the façade and thereby attach the piece to the façade by means of a cable structure and mechanical fastenings that allow a new air chamber concept to be created between the pieces and the surrounding concrete wall.

These pieces also saw the light of day in Toni Cumella's workshop and are a clear example of a way of finding solutions which satisfy advanced technological systems. They not only set the world of architecture before the craft world, but also place it before art itself, since each of the pieces has been pictorially treated by the artist Frederic Amat, which gives the whole project a human and personalised touch.

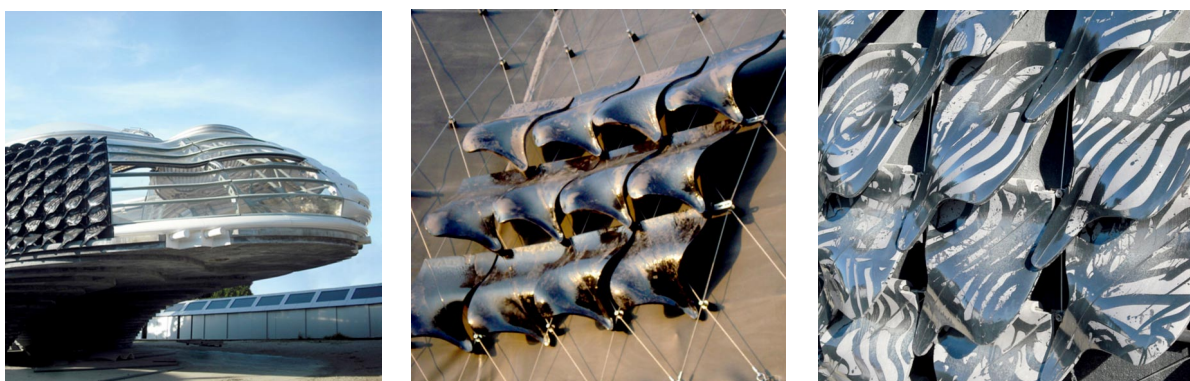


Figure 9.

By way of conclusion, it is necessary to highlight the use of ceramics as materials that are sustainable in themselves, always bearing in mind the circumstances of each individual project in order to be able to join forces, since, when dependant on some physical conditions or another, it is more convenient to use certain pieces or others.

The creation of a new piece entails work which very often remains obscure, and it is focused on the way of finding the most suitable approach for production, optimisation in manufacturing costs, installation, and transport,... stages which only serve to increase the value of the piece, which has been the subject of such a struggle and for which it doesn't seem strange for it to turn into a well-merited icon of the project. It is often difficult to find its sole creator, or rather impossible, since the success of that piece lies in the consensus of all those engaged in its construction.

No matter if the procedure of creating and perfecting the new element proves costly and drawn out in the long run. Not everything has been invented; there are always paths to be investigated and improvements to be found. It can also prove costly from an economic perspective, but not from the environmental one if we really are improving aspects such as its versatility, handling, or mechanical performance. To focus on sustainability can also be done over the long term.

A further aspect is the necessary collaboration between different professionals. The possibility of technically controlling the production processes will favour the supply of quality ceramic pieces with uniform and measurable quality, which will allow a resistance to be assigned to each manufactured element or, in any case, to verify its state of tension and mechanical properties.

To sit down to think before beginning to construct something is never a bad thing. Projects need to mature more in some phases than in others, and for this reason we must never lose patience or cease to insist in their pursuit, and less still should we worry about having to call upon some alien hands to resolve a difficulty, because it will be easier to find a solution, if there is one at hand. Perhaps this is the destiny of ceramics, to travel down a road not littered with great names but to follow a path of anonymous personages, who don't write history on their own but rather make it by working as part of a team.

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