Building methods in the architecture of Álvaro Siza

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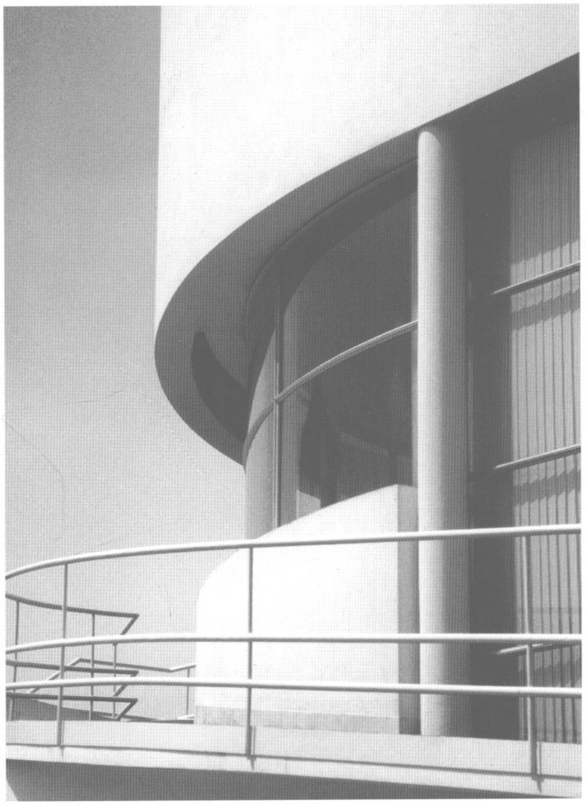
In the poetics of Álvaro Siza, the enriching experience of making architecture on site has always been very important; but even though his work has been widely recognized, published and discussed, little is known about the construction strategies employed. This paper reviews Siza's use of reinforced-concrete wall construction to create, through a process of subtraction and a search for the essential, building forms of a very particular kind.

The need to develop appropriate forms of construction has been a constant preoccupation throughout Álvaro Siza's designing career. In fact, when he was teaching precisely this subject (*Construção*) from 1976 to 1980 at the Porto school of architecture, his approach was to get students to elaborate several different construction options just for one small project.[1] His skill in conceiving an architecture deeply tied to the spirit of the place, whether urban or not, has never been his sole concern in the design process. His works – which always seem both part of their context and new entities – have an identity based on the spatial and formal qualities inherent in masonry structures [Fig. 1]. Whatever Siza's vision or models of reference, his designs are realized in his own particular manner and characterized by the use of structures which are at the same time load-bearing and enveloping.

Throughout his career, Siza has hardly ever separated the load-bearing structure from the walls that define the spatial volumes. In his complete works (see Frampton, 1999), you never encounter columns emerging or slightly detached from outer walls. From very early on he has designed architectural works with a strong masonry character well suited to the 'empiric arrangement' (Van Dijk, 1983) of the plans. The Boa Nova Restaurant, for example, one of the most significant of his early buildings, is based on a sequence of deep walls oriented in many different ways and defining the natural rocky terrace at the end of the Matosinhos seafront.

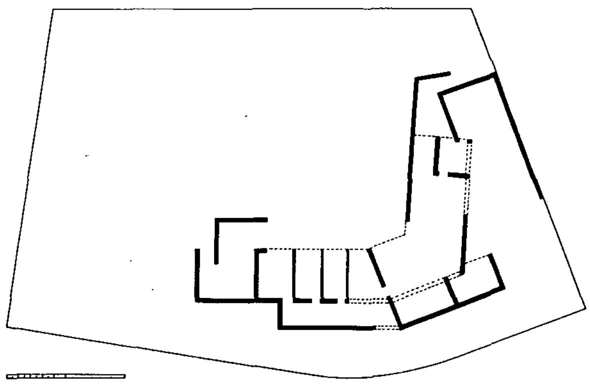


1 An identity based on the spatial and formal qualities of masonry structure. Borges & Irmão Branch Bank, elevation detail

Reinforced concrete was first used in Northern Europe in the construction of columns and beams in framed construction, following on from the use of steel and, before that, of timber. Thus, when this same (cement-based) material was introduced into the solid wall building tradition of Southern Europe, the possibility arose of transforming conventional masonry, made of discontinuous elements, into a monolithic form with masonry of considerable elastic strength.

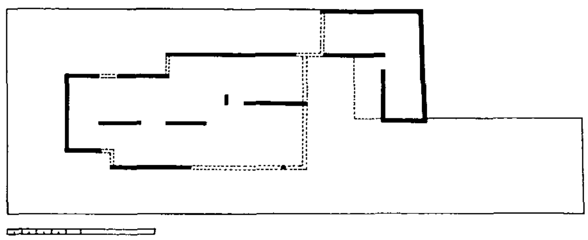
In Siza's case, this transposition occurred step by step in parallel with the search for a language: starting from the Alves Costa House (Moledo do Minho, 1964/68), to the Manuel Magalhães House (Porto, 1967/70), and finally the Pinto & Sottomaior Branch Bank (Oliveira de Azemeis, 1971/74) and the Beires House (Povoa do Varzim, 1971/74). The first one [Fig. 2a] is laid out similarly to the Boa Nova Restaurant; traditional solid walling reveals the geometry of the site, while the strength of the horizontal planes of reinforced concrete enables them to cover the wide spans between the bearing walls. From the Magalhães House onwards [Fig. 2b], vertical structures are constructed like horizontal ones; they are still walls, but are now made of reinforced concrete. Here, Siza begins to utilize the possibilities he discovers in the use of vertical structures with elastic strength.

As in the Pinto & Sottomaior Branch Bank [Fig. 2c], Siza considers the plasticity of the building as a whole. Structure is just one among the various elements establishing that *'acoustique plastic'* effect (Beaudoin, 1991), which is the hallmark of the work; but this is combined with the surprising sequence of volumes suspended in the space and concealing the logic of their structure. In the Beires House [Fig. 2d] there is a removal of volume, achieved without any additional structure. This is possible because such a box-shaped structure, made of reinforced concrete, contains so much structural redundancy that it can tolerate the loss of large horizontal and vertical sections. The Antonio Carlos Siza House (Santo Tirso,



2a

2 The search for a language: ground floor structure plans of five buildings (1964–78)
a Alves Costa House. Traditional solid walling reveals the geometry of the site
b Manuel Magalhães House. Vertical structure placed on a par with horizontal structure
c Pinto & Sottomaior Branch Bank. Plasticity of the whole is now considered
d Beires House. The missing corner and the 'tear cut' plan of the facade suggest a violent removal of volume
e Antonio Carlos Siza House. The open ventilated cavity between the inner and outer walls can be seen in the part-section



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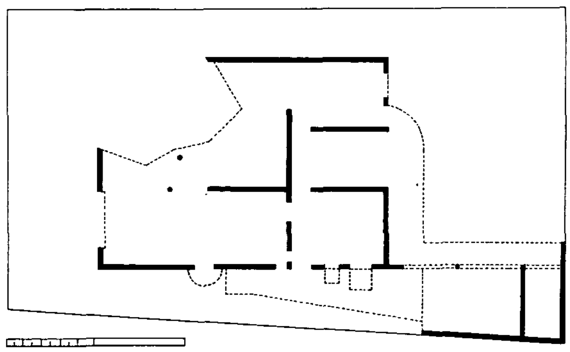

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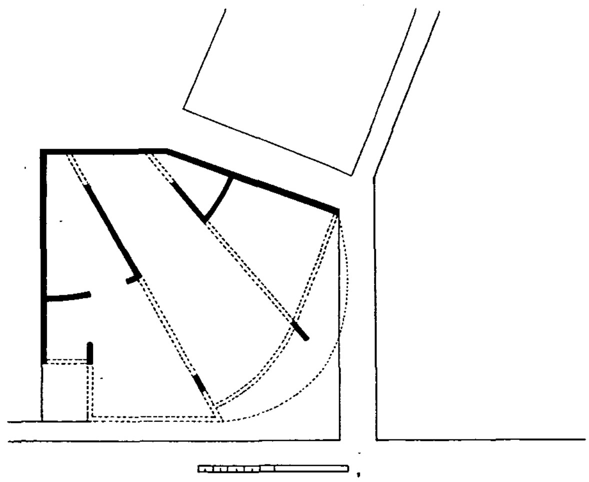

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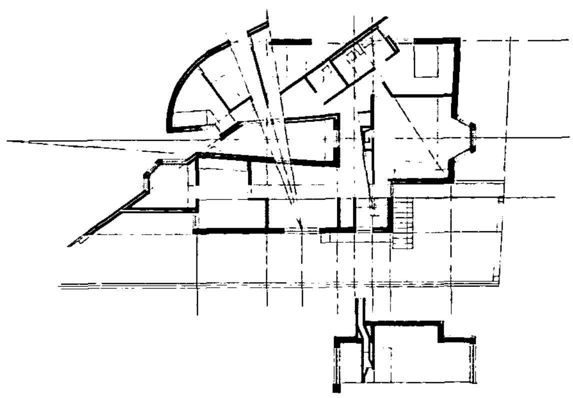


2e

1976/78) [Fig. 2e] has a peculiarity in its construction, never again adopted by Siza – the visibility of the ventilated cavity between the interior bearing concrete wall and the exterior insulating and non-structural plastered wall.

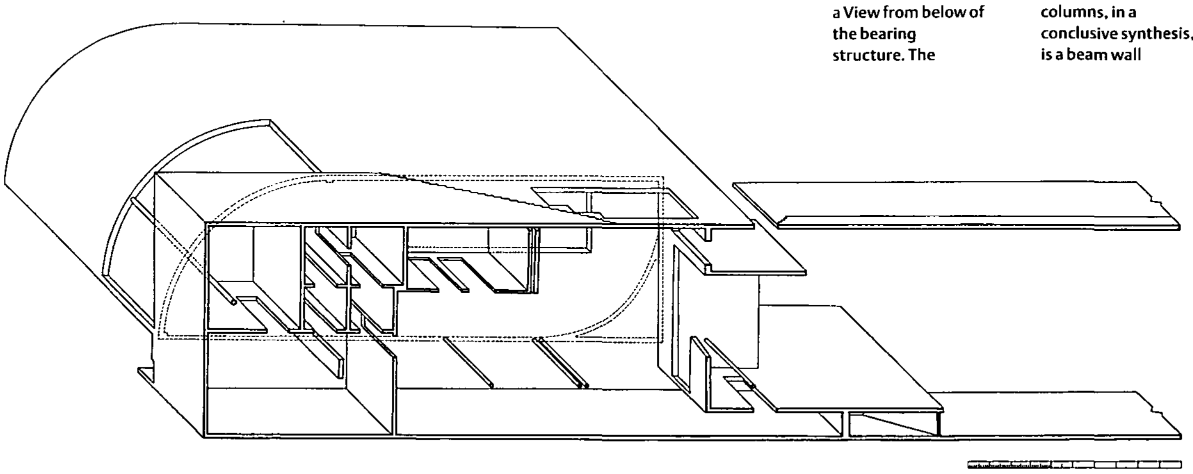
Finally, with the Borges & Irmão Branch Bank (Vila do Conde, 1982), Siza's testing of the properties that result from the use of thin wall structures is taken to its logical conclusion. The use of wide openings, clear cuts and cantilevers is achieved without the disembodiment of the *'volumétrie virtuelle'* (Ciriani, 1987) of the building box, itself perceived as the surface of an ensemble of primary forms. The bank's plan depends upon the relationship between its positioning on the site (which is similar to the surrounding buildings) and its very different form, that reflects its inner spatial qualities. This is evident in the structure, which consists of an underground level following the same perimeter wall of a pre-existing building, and an upper level that introduces point support elements to define the outer curved volume [Fig. 3a]. Above the columns, in a conclusive synthesis, we find a beam wall – that is a beam, with such little thickness and such great height, that it could be described as a wall [Fig. 3b].

Innovation and composition

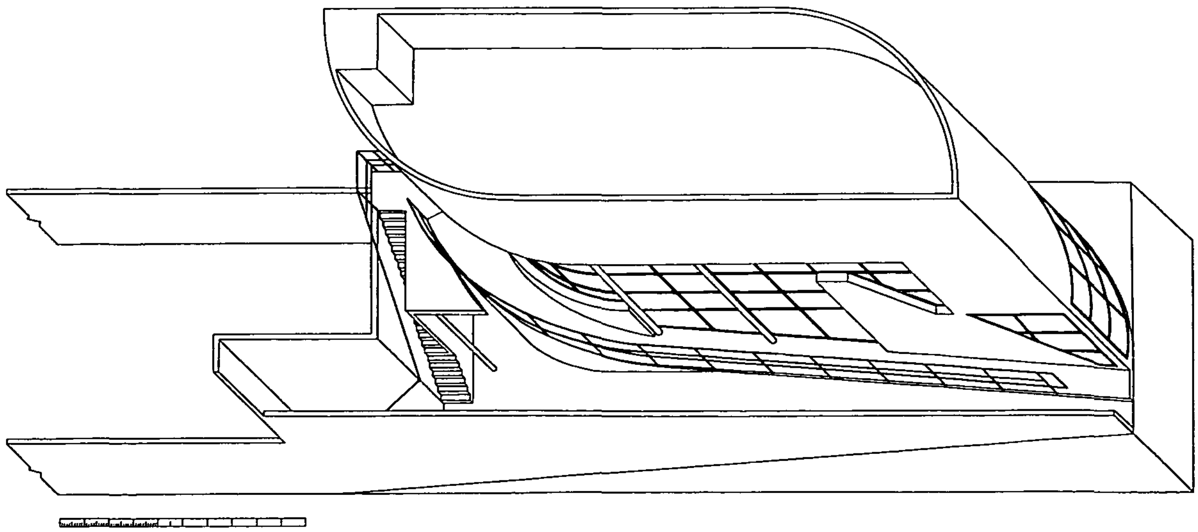
A wider use of the same building method is obvious in four important public buildings designed and built between 1985 and 1995: the College of Education in Setubal (1986/94), the new Faculty of Architecture of Porto University (1986/96), the Library of the Aveiro University (1988/95), and the Galician Centre for Contemporary Art (Santiago de Compostela, 1988/93). An even more daring and extraordinary use of the method can be seen in his most recent buildings: the Rectorate of the University of Alicante (1995/98), the Serralves Foundation Museum, Porto (1996/99), and, above all, in the Portuguese Pavilion at the Expo in Lisbon (1998).

As the size of Siza's commissions has increased, so

3 Elastic restraint structure in linear continuity taken to its logical conclusion. The Borges & Irmão Branch Bank (1982) a View from below of the bearing structure. The basement plan follows that of an earlier building b Axonometric projection of the main glazed surfaces. Above the columns, in a conclusive synthesis, is a beam wall



3a



3b

has the need for technical innovations which have themselves generated compositional possibilities. Structural steel beams, for instance, have been introduced to minimize the deflection in horizontal slabs, bridging very large spans or projecting in large cantilevers. These beams are always hidden by suspended ceilings or concealed within the thickness of the slabs, thus reducing the thickness itself. A brilliant plastic quality is developing and invoking an intense feeling of energy and lightness in these chaste white, thin and flowing structures.

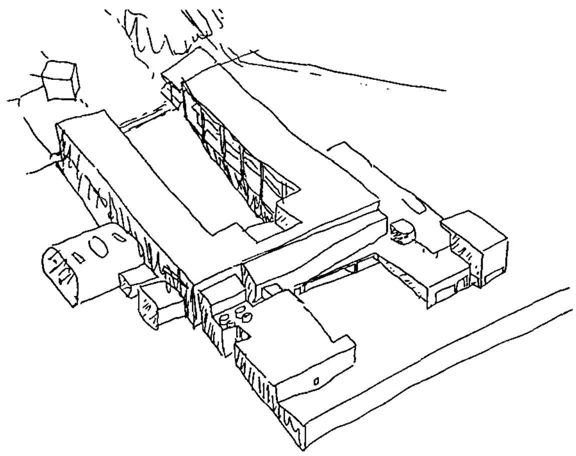
A perfect example of this quality can be seen in the College of Education in Setubal, where an elongated 'U' shaped court [Fig. 4a] dominates adjoining extensions including a gym, equipped with skylights, and a small cubic auditorium with a curving facade. Two additional extensions shelter the entrance on the short side of the 'U'. From the double-height hall one can sense the long two-storey classroom wings. Their inner facades consist of a double-height portico with a projecting balcony running the full length of the wing and providing a shady walkway under the portico. Towards the end of one of the wings, the portico is enlarged to contain the ramps that descend from the balcony together with two columns inclined as if they were tie beams [Fig. 4b]. Where the other wing begins there is an enclosed stairwell [Fig. 4c], connecting the two floors and forming a composite curving bulk, supported on an axial downward tapered vertical fin. All these heterogeneous shapes, most of which would otherwise be seen as materially distinct from each other, are here developed and unified by a single white wall, made of an invisible combination of concrete and steel.

The high point of this approach, in the Portuguese Pavilion for the Expo 1998, is a canopy consisting of a thin (200mm) reinforced-concrete slab, suspended between two buttress porticoes and covering a span of 60m. The building [Fig. 5a] is in fact a single block (70 x 90m) of two floors and a basement exhibition and facility area, linked to a big square (58 x 60m), covered by a roof without supports – a concrete and white painted tent [Fig. 5b]. Speaking about its construction, Siza said: 'In fact the possibility was at one point suggested by the engineer of making the roof as an actual tent, for example in a light material like fabric or light metal, and I said "No I want it heavy. I want it heavy like stone"' (quoted from Curtis, 1999). The combination of cement and steel is based on a sophisticated system of steel cables, running through a tube within the thickness of the slab. The solution [Fig. 5c] allows light in, along the lines where the tent is connected to the shaped piers. The result is a monumental presence with an overarching floating effect, which both cuts off the immediate surroundings and, taking advantage of the seascape, puts the visitor 'in touch with something more vast' (Curtis, 1999).

A reference for future works

Apart from these obviously unusual examples at Setubal and the Expo, Siza's language becomes fully expressive and personal in the new Faculty of

4 A brilliant plastic quality in which heterogeneous shapes are unified by white walling: College of Education of Setubal (1986–94)
a Siza's sketch showing the large U-shaped court and the smaller entrance court
b End section of one of the court wings showing the inclined columns
c Short side of the portico with the enclosed stair on the right

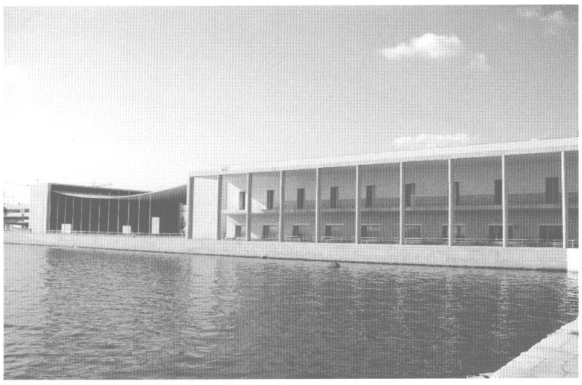


4a

4b

4c

5 The high point of plastic development: Portuguese Pavilion for Expo '98
a Overall view with suspended canopy at left
b The covered square with the piers beyond
c Detail of the connection between the canopy and the building, showing the light entering between the two structures



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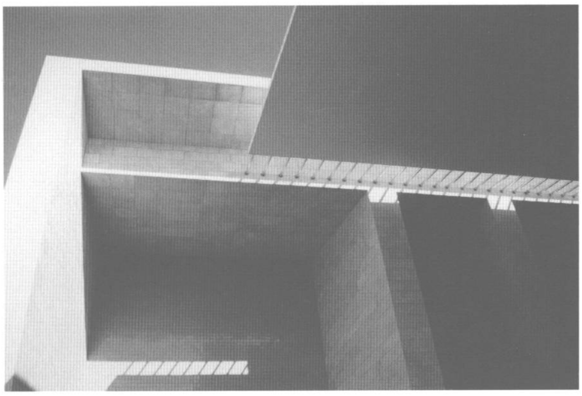


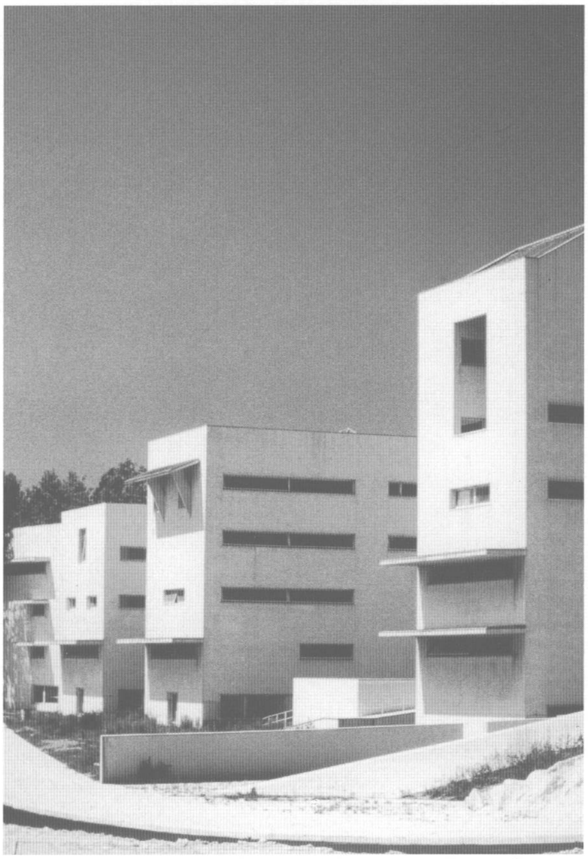
5c

Architecture of Porto, itself a reference model for future works. The Faculty complex consists of several buildings looking like single objects moulded and enclosed in pure geometric forms, emerging from an assemblage of homogeneous plans designed with raking outlines and many long 'ribbon' windows. Working with the same continuity of material, thin canopies project above the ribbon windows on the south and river-side facing facades [Fig. 6a]. Further appendages include small volumes highlighting the entrances' locations. In this building, and in all those that followed it, the insulating and non-structural walls are replaced by a rigid-foam insulation, with a plaster or stone rendering, bonded to a reinforced-concrete wall [Fig. 6b]. The inner skin of the load-bearing reinforced-concrete walls has a directly applied layer of plaster or, in some places, a stone facing. Ceilings are made of plasterboard so as to allow space for service installations, to hide structural unevenness or to further model the interior space.

In the large and interconnected bodies of the north wing of the new Faculty there are some special spatial solutions that fully express the inherent possibilities of this construction method. The auditorium, the exhibition gallery and the library are three distinct volumes joined together by a walkway that begins where a ramp [Fig. 6c] leads to the auditorium. Walking along it one senses a space which is twice the size of that of the ascending rampway [Fig. 6d]. This is because the auditorium wall, where it intersects with the ramp, appears de-materialized, creating a single space where the ascending ramp is combined with the horizontal walkway. This is another example of a beam wall: above the space just described, the facade of the auditorium bears at one end on the semicylindrical volume of the exhibition gallery and then on an intermediate column before becoming a full wall again [Figs. 6e and f]. The opening positions, at a distance from the support points, show how this facade works as a beam. A long window runs along the whole length of the ramp's outer wall, and is interrupted only at a mid-point.

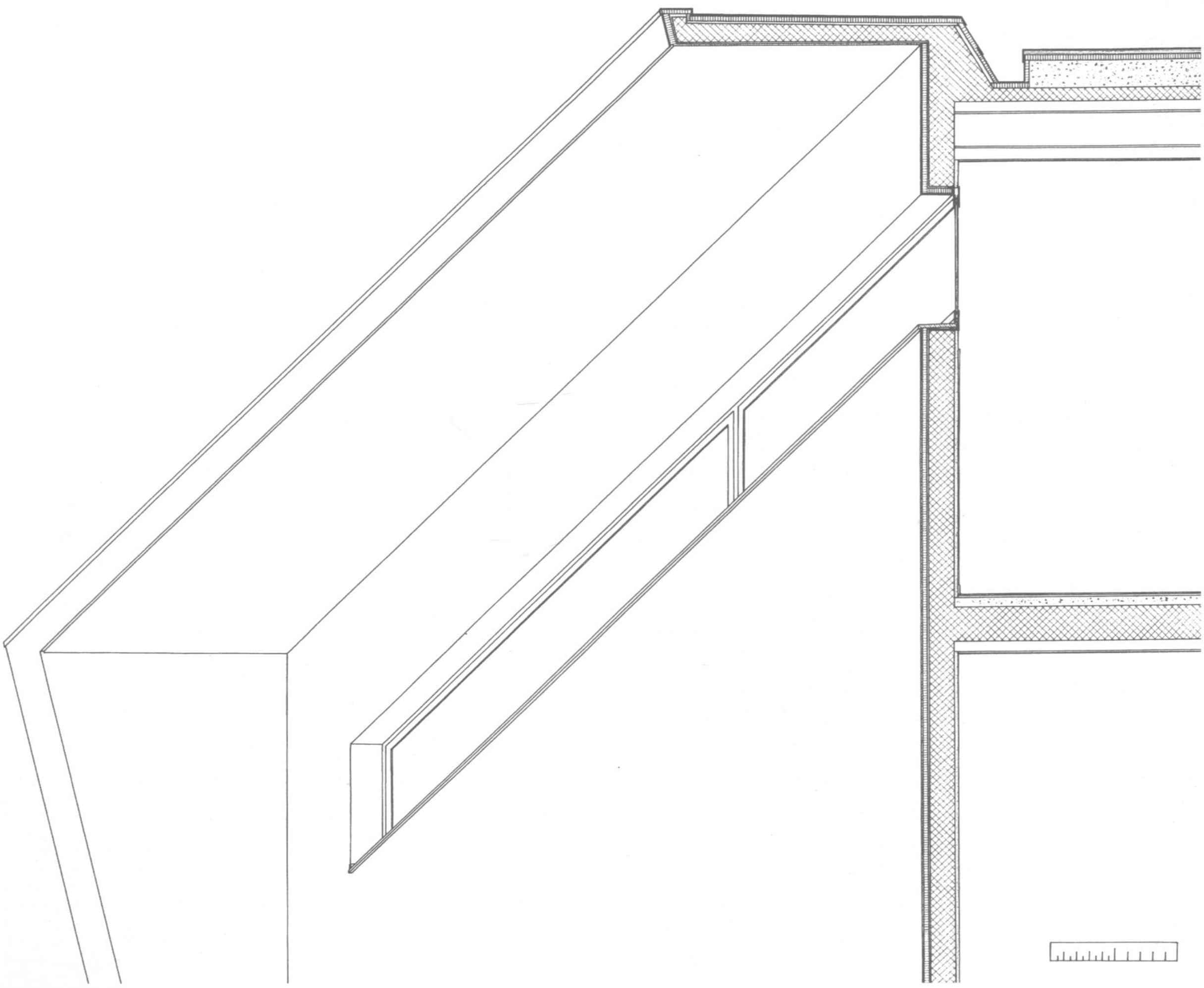
The exhibition gallery [Fig. 7a] is divided into an inner semicircular hall and an outer walkway leading to the library. Both the hall and the peripheral space are lit by a luminous ceiling ring. To achieve this effect the roof plan is divided into a large semicircle and an annulus, at different levels so as to allow reflected rays of light to enter into the room. The soft quality of the light and the floating effect evoked by the large projecting surface, define an abstract space, seemingly denying the reality of its construction [Figs. 7b and c]. Both the effect and the environment appear somewhat miraculous (Beaudoin, 1991). A study of the section reveals that, in order to distribute the torsional stress over a rectangular surface instead of along a line, the large jutting out element is a semicylinder (with a radius of 6m) and not a semicircle [Fig. 7d].

On the other side, four lecture room blocks [Fig. 8a] are set out within identical rectangles enclosed by load-bearing perimeter walls. With no



6a

6 A fully expressive and personal language: new Faculty of Architecture of Porto (1986–96)
a Four lecture room blocks of the south wing
b Section through the facade of the main building (auditorium and administration) of the north wing
c Ramp leading from the north wing walkway to the auditorium
d View up the ramp. The auditorium wall to the left is dematerialized
e Longitudinal section of the ramp leading to the auditorium, the facade of which is a beam-wall
f Axonometric projection of e



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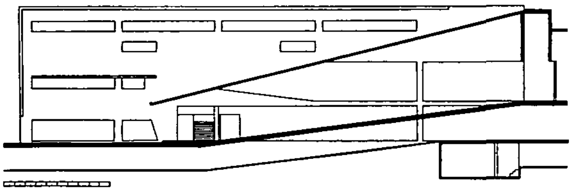
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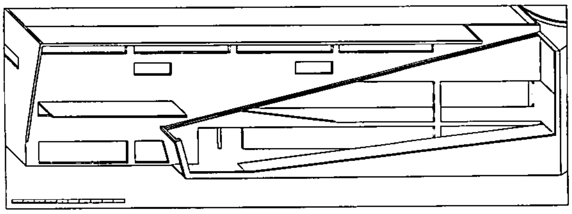

6f

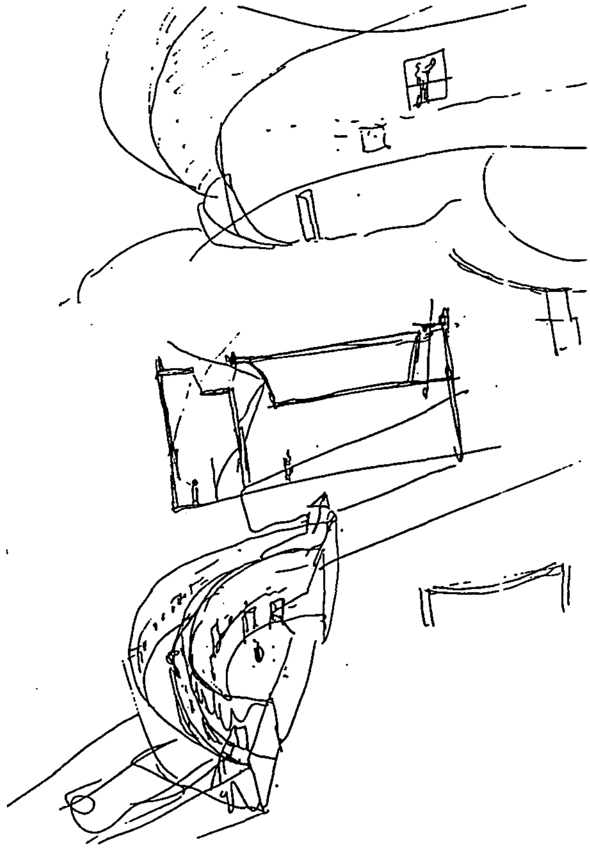
additional load-bearing walls obstructing the 10×16m floorplates, each building has been planned in a different way, according to the position in the stairwell. The plans change at each level, depending on the position of the windows that follow the landscape (to the east and to the south) and on the layout of the main rooms (running both crosswise and lengthways). This is the case, for example, in the easternmost block [Fig. 8b], where the disposition of the rooms varies on each floor. On the top storey there is a totally open space apart from the emerging volume of the stairwell; this is the sculpture studio, and for this reason the peripheral walls are almost blind and light comes in from two different skylights that provide the upper part of the building with its external outline.

Following such a solid wall strategy, like this one with a load-bearing perimeter on four sides, the layout of the rooms can change freely at every level, with partition walls placed freely as in a point support structure. But in fact there are no such supports, and instead it could be said that the full use of the perimeter structure makes it possible to create a structural bay large enough to contain many different functional patterns. All of this is echoed externally by the position and dimension of the openings, which are freer than those possible in traditional solid wall construction.

Boxes, beam walls and eccentricity

The box-shaped structure of reinforced-concrete slabs and walls has been researched and used by Siza for a long time in collaboration with the engineer J. Araujo Sobreira, now succeeded by his son João M. Sobreira. Among the box system's most outstanding characteristics is the ability to accommodate large and even repeated interruptions, like openings or voids in the continuity of the vertical elements. Underlying such freedom is the application of the structural concept of the 'beam-wall'.[2]

Beam walls allow elevations with long horizontal windows; the extreme case being the main facade of the Galician Centre for Contemporary Art [Fig. 9], where the lower part of the facade has been cut out along all its length, so that the upper part becomes a beam the height of which is proportional to the span that has to be covered. Inside the building, openings are easily made in the bearing walls; these can be



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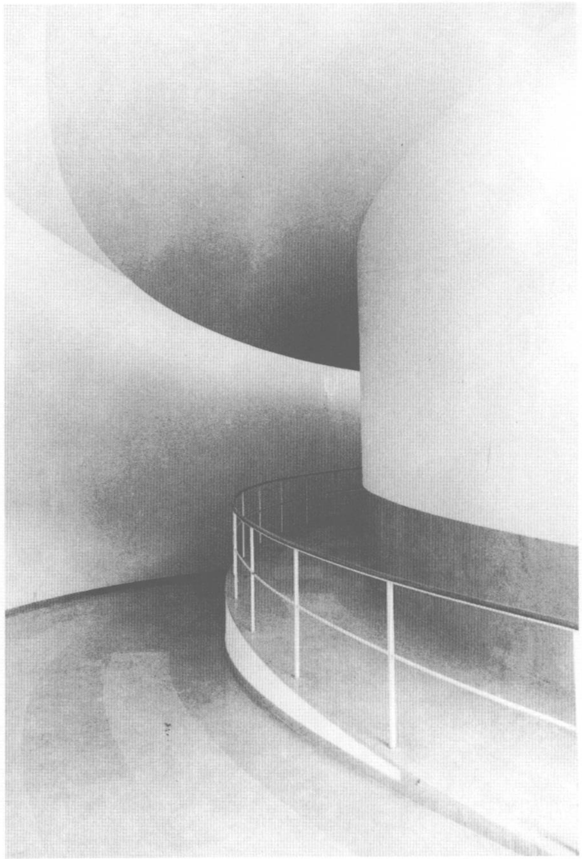

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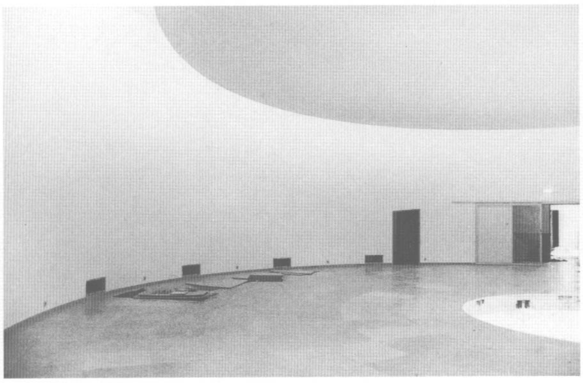

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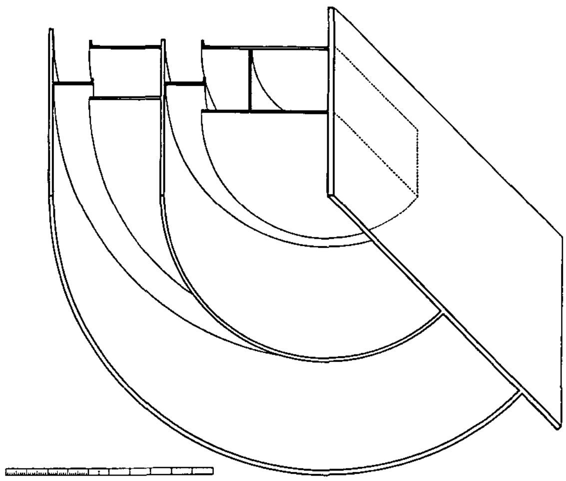


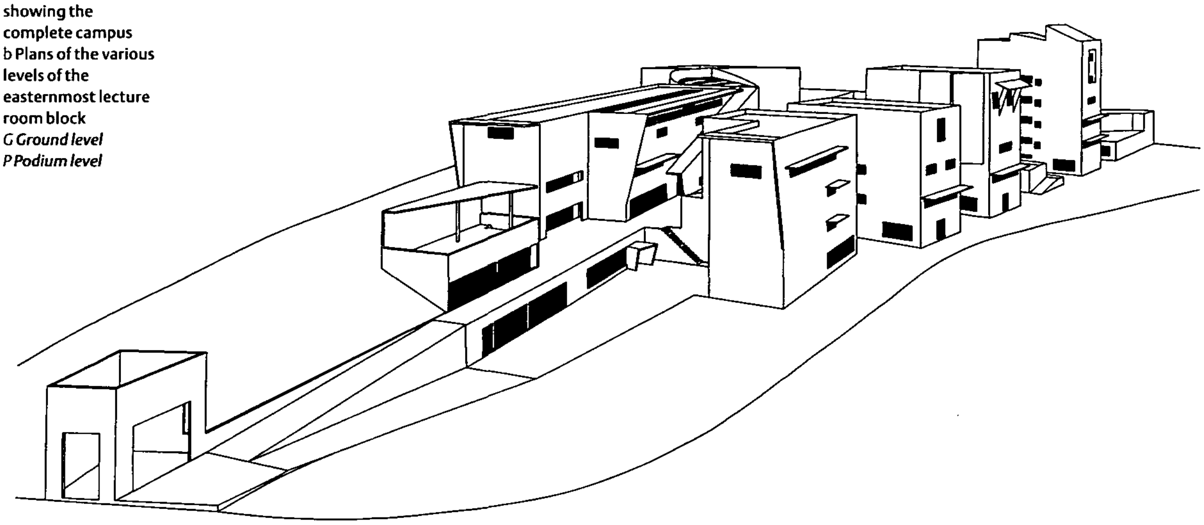
7d

7 A somewhat miraculous effect and environment: the exhibition gallery of the new Faculty of Architecture of Porto
a Siza's sketches
b Gallery and the external walkway to the library: an abstract space denying the reality of its construction
c The same
d View from below showing the bearing structure for the gallery: the torsional stress is distributed through a semicylindrical form

omitted and replaced by a column at one level, and then continue on the upper level as a full wall, so as to resemble a beam with an intermediate point support. The latter could even to some degree be removed; looking at the section one could think it was a solid wall resting on a floor slab, whereas it is in reality a fixed beam.

The point support elements soften the typical rigidity and heaviness of these solid wall structures. Solid walls and columns have been combined throughout time – as in Roman architecture – but Siza creates a structural interplay within a framework of subtly deformed planes. In fact, the structural system is often interrupted, shifted, bent, tapered or widened depending on the particular conditions. Thus, the various structural elements can be set out without the need for reciprocal symmetry. So, as the building follows the complex and multilinear

8 Freedom in plan and elevation through the use of perimeter bearing walls: new Faculty of Architecture of Porto
a Perspective showing the complete campus
b Plans of the various levels of the easternmost lecture room block
G Ground level
P Podium level



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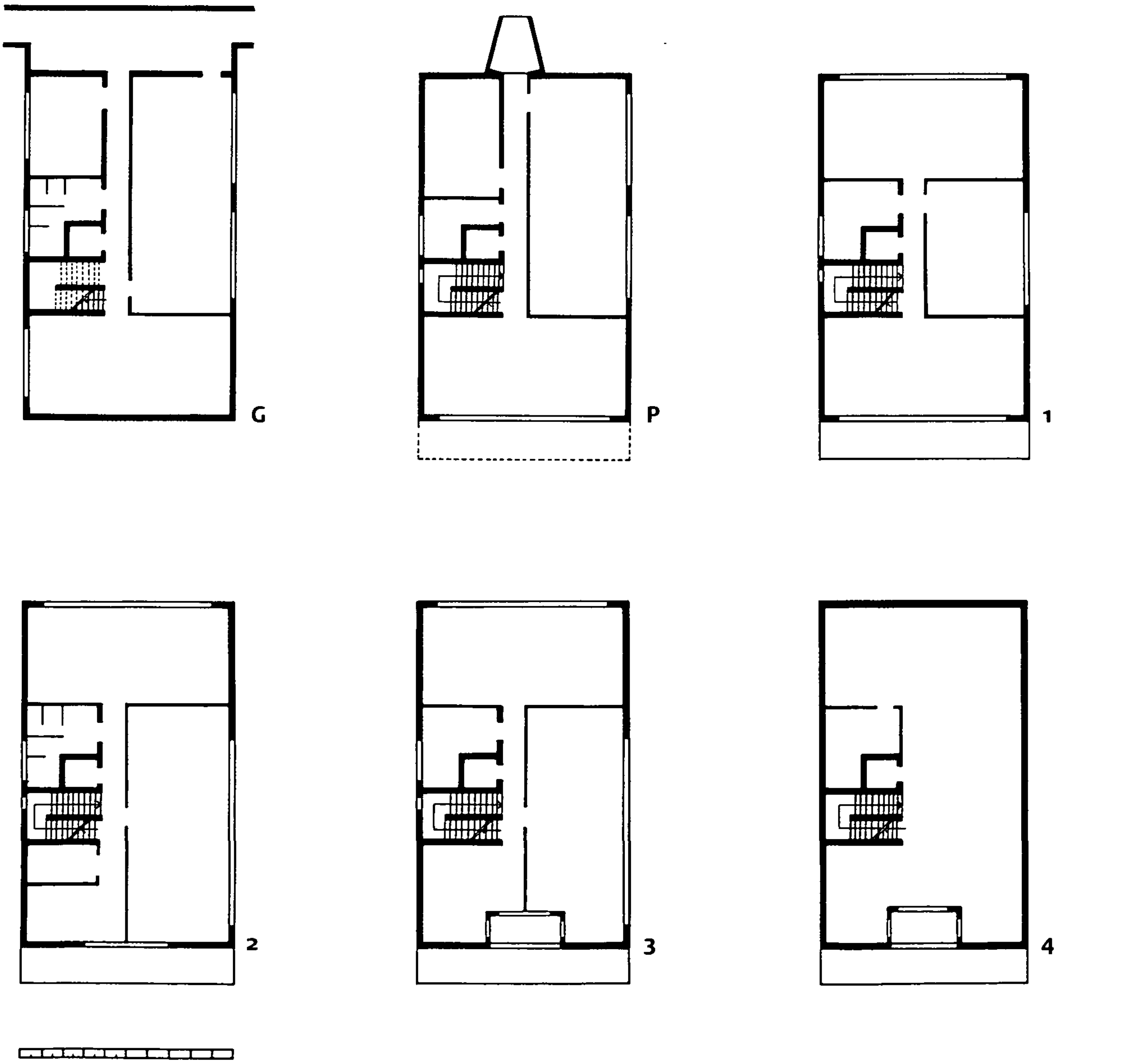


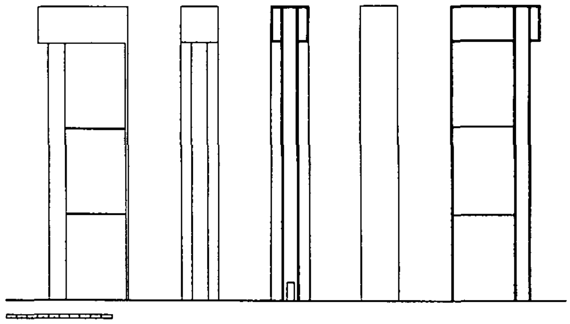
8b

geometry of the plan, load distribution becomes unbalanced, causing compound and complex strains. At this point vertical and horizontal planes have interchangeable roles, and therefore need a structure with stiffness in all directions.

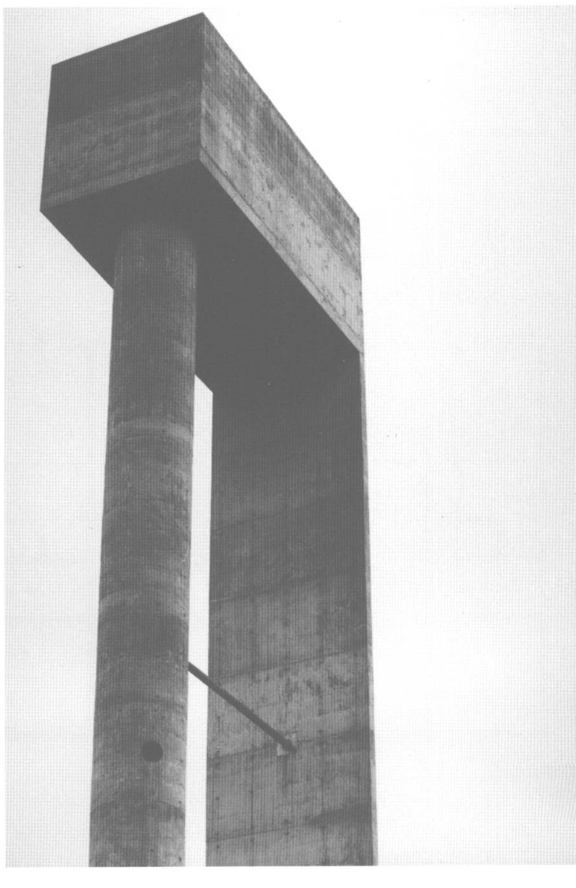
The tension, generated by the opposition of regular and warped parts, can also be seen when geometric volumes appear suspended in the air. The Water Tower of the University of Aveiro (1988/89), has been described as 'a simple volume placed on eccentric supports',[3] and can be considered to be the classic example of a structural and compositional unit [Figs. 10a and b]. The eccentric balance achieved in the distribution of the load is a compositional choice which fully exploits the features of the materials and of the construction method.

Eccentricity, as a principle regulating the interaction between different parts of a work of architecture, can also be seen in the Swiss Pavilion of the *Cité Universitaire* in Paris (Le Corbusier, 1930). This building [Fig. 11] was planned in terms of dual contrasts: 'Le Corbusier places the light structure of steel against the massive reinforced-concrete base, the stereometry of the prism in the upper part of the building against the curving lines of the entrance hall and the stairwell, the curtain wall of the southern side against the full wall of the northern side (...). This use of two different construction methods for each one of the main elevations of the building resulted in the detachment of the static axis of the prism from its geometric centre: some bone-shaped pillars are set up along this axis. And even their shape should be considered as a kind of ideal pressure line' (Calatrava, 1989). Comparing the Aveiro Water Tower with the Swiss Pavilion we see that, while in Le Corbusier's building the eccentricity lies in the use on two opposite sides of two materials of different weights, Siza chooses explicitly to arrange the vertical structure in a different manner from that suggested by the static axis position.

9



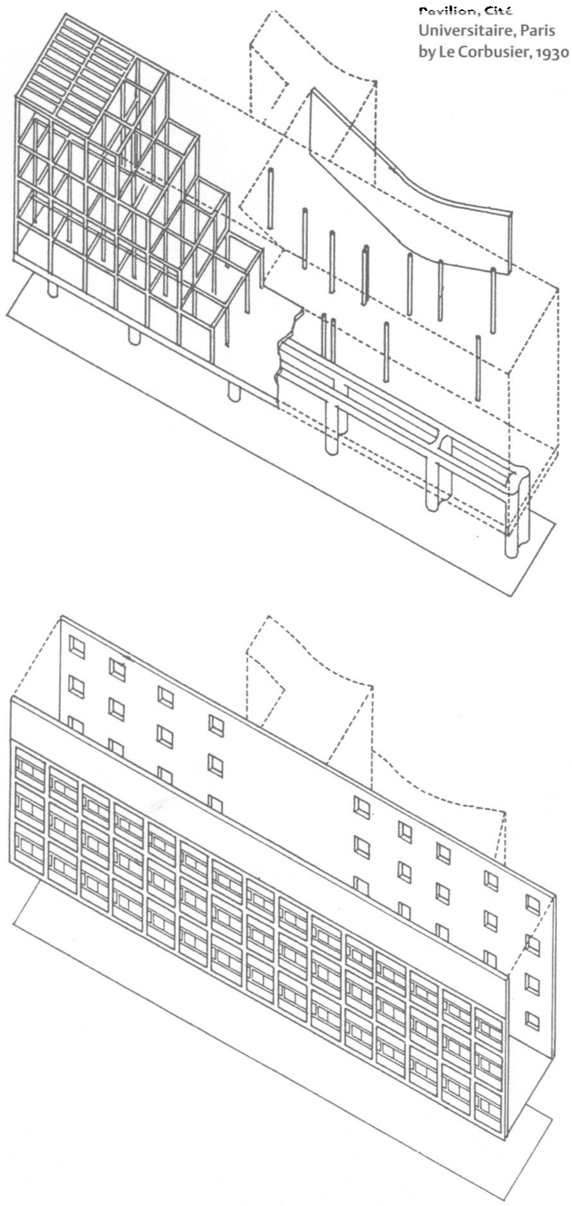
10a



10b

9 Beam walls allow elevations with long horizontal windows. Galician Centre for Contemporary Art (1988–93), partial view of the main elevation

10 The classic example of a structural and compositional unit. Water tower of the University of Aveiro (1988–89)
a Sections and elevations
b View



11 Eccentricity as a principle regulating the different parts of a work of architecture. Swiss Pavilion, Cité Universitaire, Paris by Le Corbusier, 1930

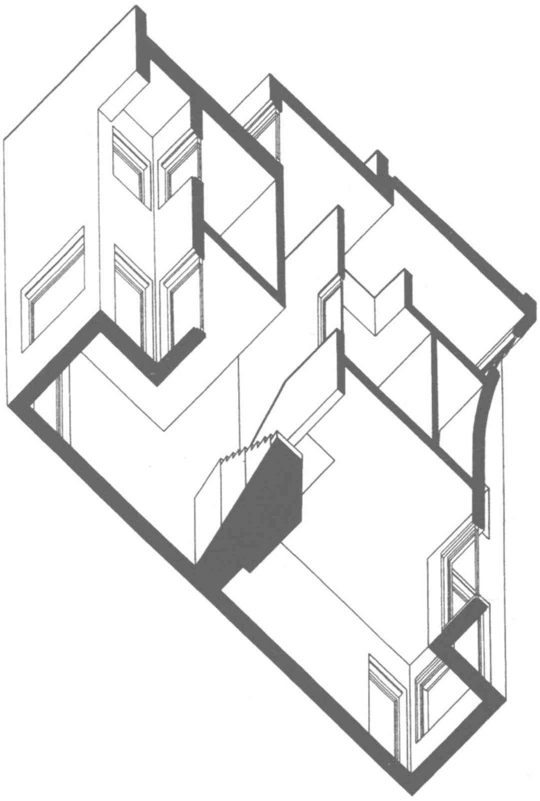
This kind of eccentricity can be seen as a less ambitious version of the cantilever/jutting building, that creates the greatest degree of disequilibrium in the balance of the load – an approach sometimes used by Siza himself. Once more, a modified and well-judged use of projecting structures (which somehow retains its origins in conventional masonry practice) shows how Siza's passion for walls seems to be the *leitmotiv* for his successful and highly personal use of reinforced-concrete construction.

Manipulating 'spatial coefficients'

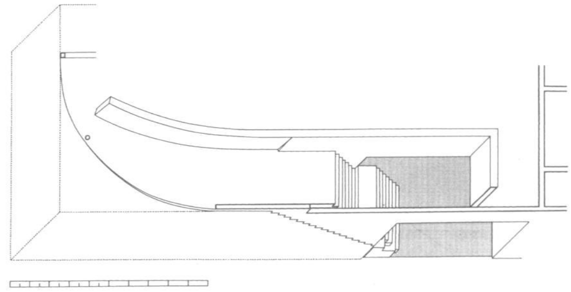
Colin Rowe (1976) showed how spatial coefficients[4] depend strictly on, and change in relation to, building methods adopted by Classical architecture on the one hand and by modern architecture on the other; moreover he shed light on Le Corbusier's attempts to interchange and combine the different spatial properties connected with traditional solid wall and reinforced-concrete framework construction. An understanding of this proposition enables one to analyze the function and significance of walls and columns in plans and sections that show a particularly crafty manipulation of spatial coefficients.

Among Siza's works, the Duarte House (Ovar 1981/85) is the closest to the traditional model of wall construction; right-angled walls enclose a traditional solid with an emphasized central void connecting the rooms on three levels. Floor openings are used both to create a spatial focus and to give a certain vertical movement of space [Fig. 12a]. Horizontal concrete slabs are not pierced or cut by these openings, but are interrupted in their progression and vertically folded and moulded in response to the spatial layout, giving the building a certain sculptural quality. The staircase linking the ground and basement floors of the Borges & Irmão Branch Bank [Fig. 12b] appears to be carved. In concrete wall structures, floors are, effectively, plates that emerge from vertical slabs without any interruption or material change; they can, therefore, be displaced and modelled, to produce such spatial effects as that described in the exhibition gallery of the new Faculty of Architecture in Porto. Likewise, a study of a cross section through the entrance hall of the College of Education in Setubal reveals a special quality described by Rowe (1976) as the 'firm sectional transmutation and modeling of volume'. The outline of this section is enriched with great virtuosity by the wide projecting and curved plan of the canopy above the courtyard entrance, while the expansion in depth of the hall embraces the suspended volume of the corridor of the first floor [Figs. 12c–e].

Siza's plans cannot be defined as free, but the ability to construct large and all encompassing bays allows for flexibility, and does not require the same plan to be repeated at every level, as in the four lecture blocks of the new Faculty of Architecture of Porto. When, as often happens, the building is made up of large separated but adjoining structural bodies, the beam wall is employed to generate a certain freedom in the planning of those areas where major spaces intersect. And the beam-wall is not reinvented, but is organically integrated within the concept of the building. In other words, the structural system can withstand the replacement of a bearing wall with a single support point, to 'free' or open up the plan. The Museum of Contemporary Art in Santiago de Compostela is based on the combination of several solid geometrical forms, positioned differently according to the elements that surround the site, but all dependent on the juxtaposition of vertical and horizontal slabs. Columns are inserted to solve the relationships that link these forms, as is wonderfully shown in the foyer of the Museum [Fig. 12f]. At La Tourette, Le Corbusier worked 'By cramming a Tokyo-type megaron, the church, and a Poissy-type sandwich, the living quarters, into the closest proximity (...)'



12a



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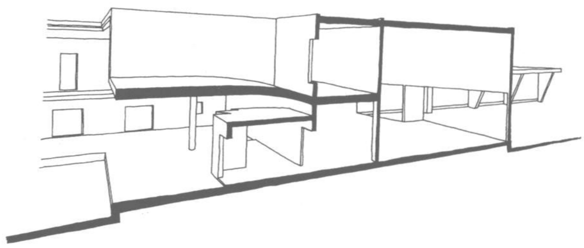

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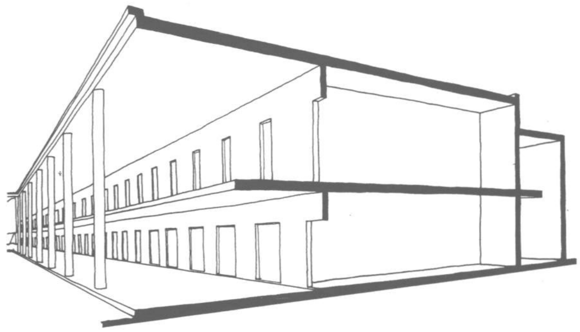

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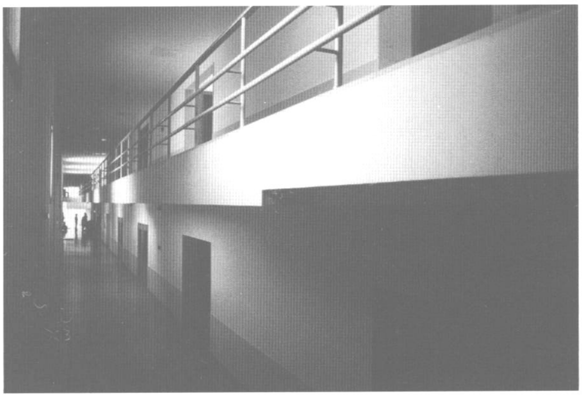

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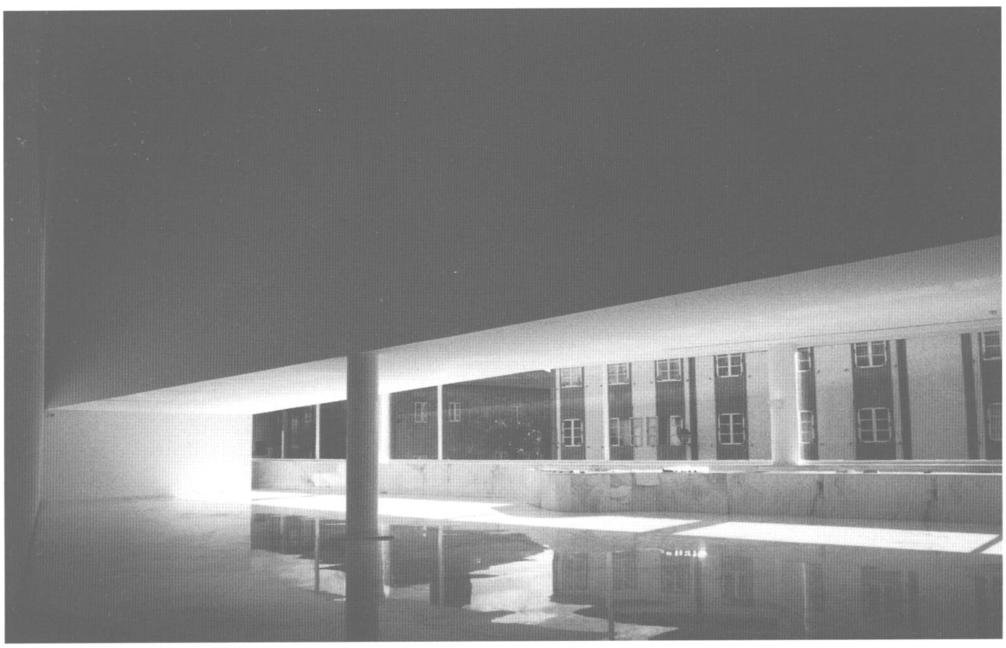


12f

12 Wall construction models: the beam-wall is organically integrated – not reinvented
a Duarte House, axonometric section from below. Floor slabs interrupted and folded vertically in response to spatial layout
b Borges & Irmão Branch Bank: the staircase from the ground floor to the basement appears to be carved
c College of Education of Setubal: perspective section of the entrance and one of the lecture rooms wings 'firm sectional transmutation and modelling of volume'
d Lecture Room block with similar qualities
e Double-height volume of the corridor to the lecture rooms
f Galician Centre for Contemporary Art, internal view of the foyer

(Rowe, 1976), while in the Museum of Santiago the compression of related volumes reveals a latent structural support point.

Facade layering

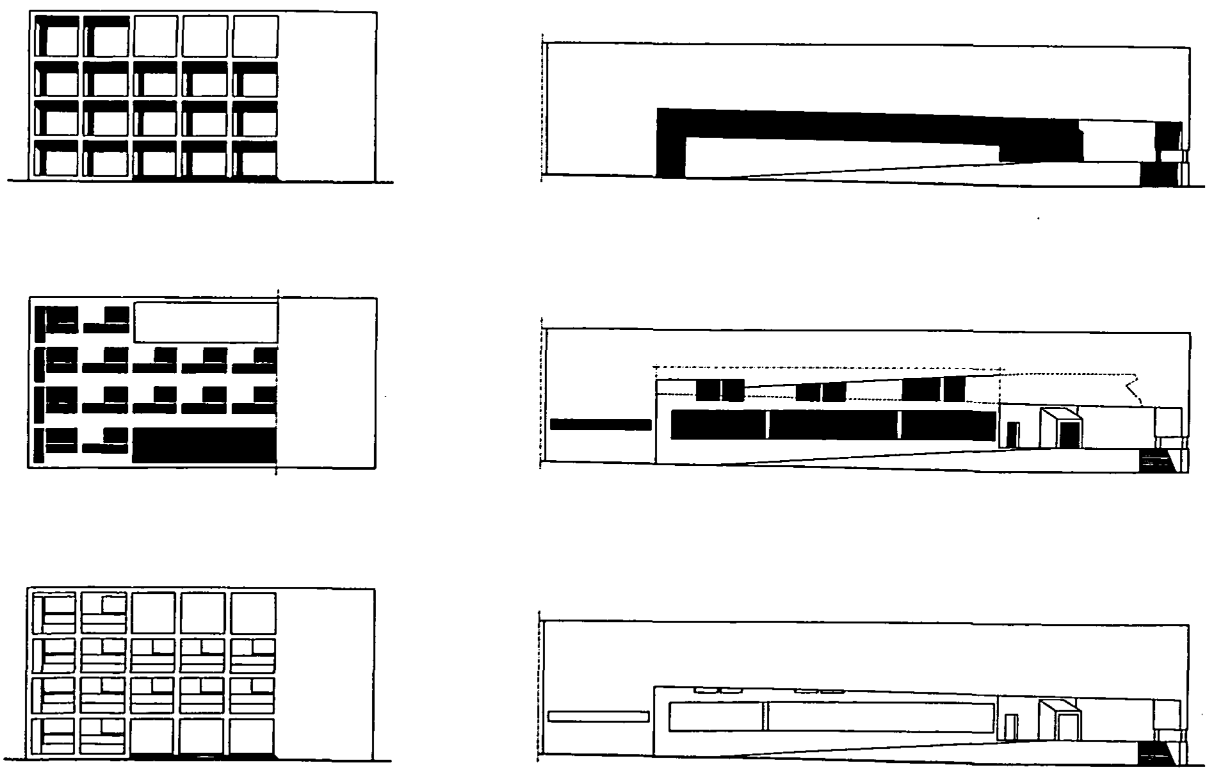
If the choice of structure is also a choice of compositional technique in the building as a whole, then that same relationship between construction and form can be expressed in the facade design through the juxtaposition of the bearing structure and the perimeter wall.

To some extent the simultaneous presence of solid mass and elastic strength reminds one of the early Italian rationalists, who also faced the problem of using a reinforced-concrete framework structure within a familiar masonry building tradition. For example, the main elevation of the Casa del Fascio in Como (Giuseppe Terragni, 1932/36) is based on the juxtaposition of the solidity of the wall and the emptiness of the framework, which appears cut out of the massive elevation surface; while the horizontal windows are placed at regular intervals on a punctured plan behind the empty frame [Fig. 13]. Similarly, the main elevation of the Museum of Contemporary Art of Santiago de Compostela is organized around two planes one behind the other; the outer one divided into a solid and a void part and the recessed one accommodating the openings necessary for the interior spaces. In this way, the simple lines of the outer stone wall are clearly outlined.

In the vast majority of his works, Siza has rarely used exterior exposed concrete finishes, preferring to plaster his early buildings directly onto the surface of the wall whether or not it be concrete. Later, with the new Faculty of Architecture, he adopted and fully exploited the 'layered nature' (Ford, 1996) of the contemporary wall, which here meant a layer of rigid insulation over the concrete structure which was then stuccoed or dressed with stone. In the wall finishes of his most recent buildings, Siza starts with simple references to traditional imagery and taking advantage of the technological possibilities offered by this building system transforms the old language into a much freer one. Various examples of this formal concept can be seen in the buildings he completed at the same time as the new Faculty of Architecture.

The main elevation of the Aveiro University Library [Fig. 14a] has a limestone wall cladding, with a joint pattern resembling that of a traditional stone wall, but the thickness (100mm) of the stone cladding is simply revealed at the corners. At the same time, the building's brickwork cladding continues over vast voids as if it were weightless, since it is carried by concealed lintels [Fig. 14b]. In the Museum of Santiago, a granite veneer is mounted on to the external faces of the concrete walls. The veneer is in a

13 Analysis of the main elevations of the Casa del Fascio, Como (left) and of the Galician Centre for Contemporary Art (right). Wall plane sequences, top; shape and the location of the openings, centre; combined in final elevations, bottom



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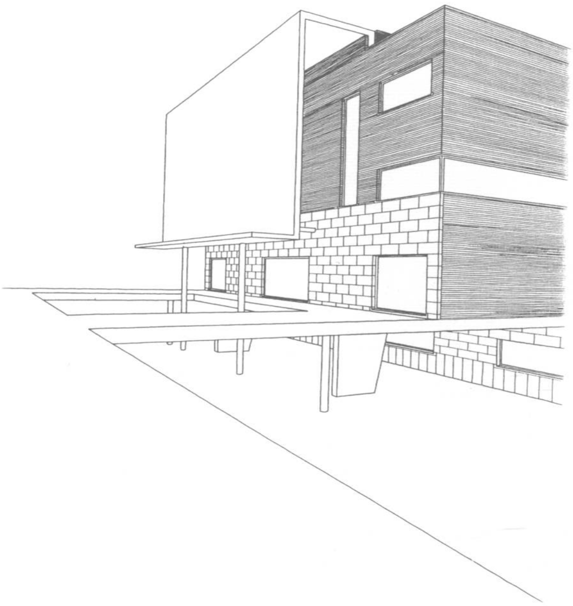
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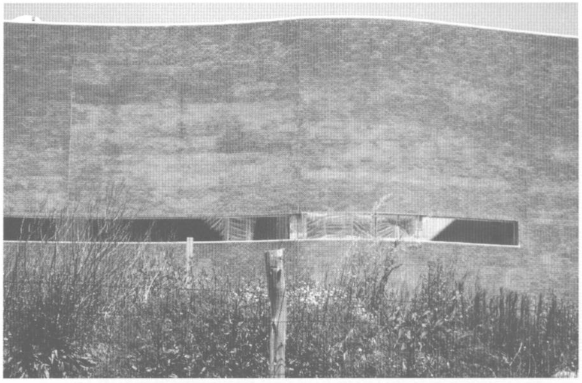
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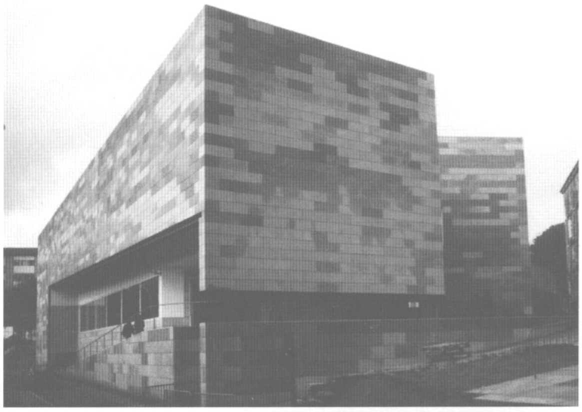
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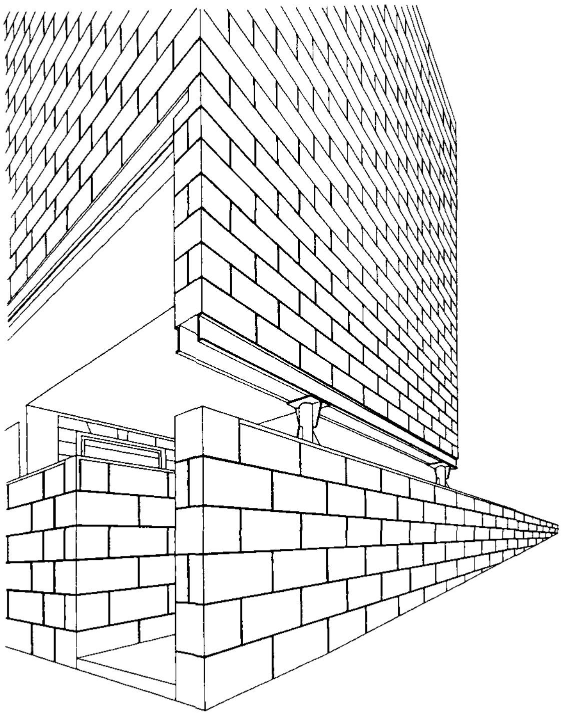
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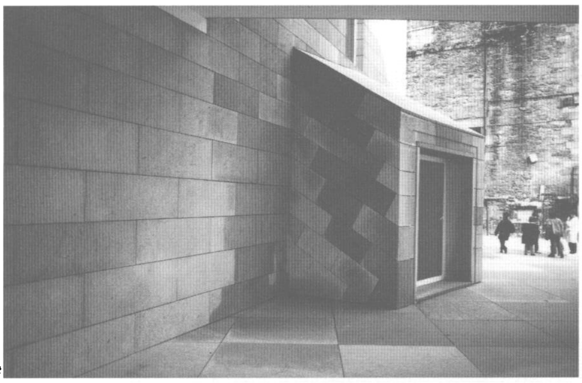
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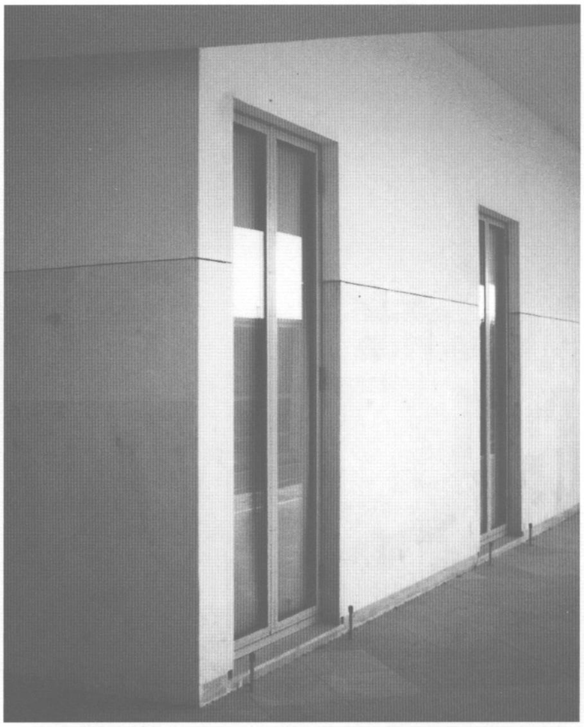
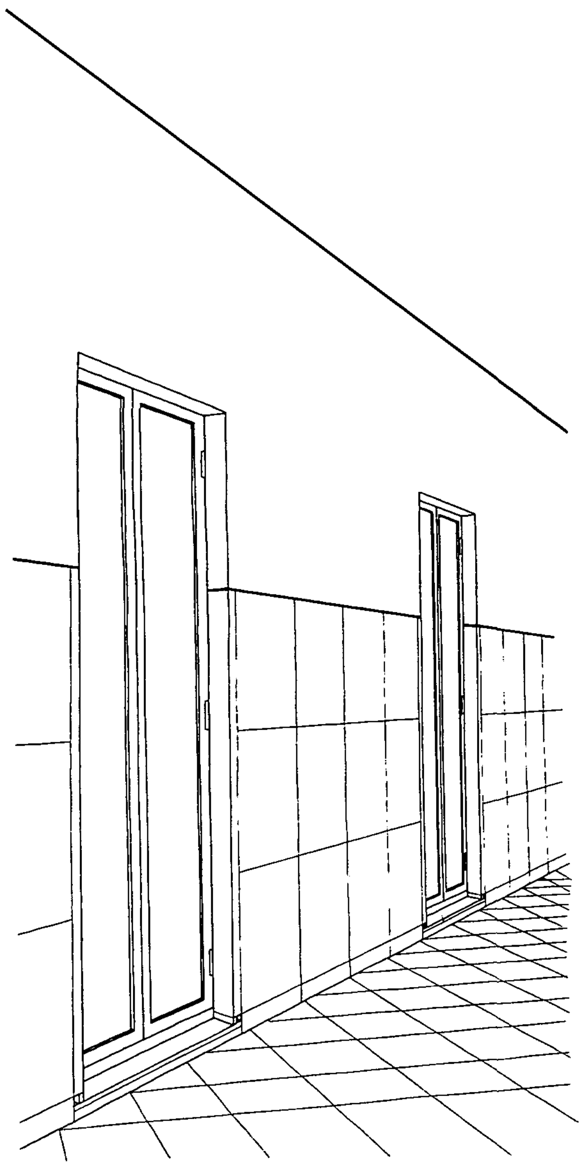

14f

14 Siza's interpretation of the layered nature of the contemporary wall
a Aveiro University Library (1988–95): part perspective of the main elevation showing stone cladding revealed at corners
b Large window of the Library's side elevation spanned by seemingly weightless brick
c,d Galician Centre for Contemporary Art: the bond pattern of the granite walling on the surfaces of the facades suggests solid blockwork ...
e ... but is finally exposed as a veneer
f College of Education of Setubal: joints in the stone plinth are filled with stone dust to suggest a massive block out of which the lecture room entrances are carved



15 The Setubal corridor showing the stone joints before caulking

traditional bond pattern; moreover, edges and corners do not reveal the thinness of the stone, as they are made up by L-shaped pieces to look like massive corner blocks [Figs. 14c and d]. However, the deception is exposed, because those parts where the stone is laid in oblique patterns [Fig. 14e] clearly reveal it to be a suspended veneer. Another example, the courtyard of the College of Education of Setubal has a veneered calcareous stone plinth 1.8m high and here the problem of corners and edges is solved by exposing the thickness of the stone on the plane of the facade [Figs. 14f and 15]. The joints between the various panels are caulked and smoothed with stucco made with the same stone dust, so that the entire plinth looks like a single carved block affirming the building's massive character.

Subtraction and a search for the essential

It is the textures and surfaces of the primary forms in his buildings that give Siza's architecture its particular spatial quality and aesthetic. These derive from a conceptual process of subtraction and search for the essential. Having abandoned traditional masonry construction, he employs reinforced concrete to create autonomous volumes with an intense spatial quality. However, this architectural language remains, like traditional masonry construction, firmly based on the expression of mass, weight or (apparent) absence of weight.

Notes

1. *'Dans l'enseignement de la construction tel que je le conçois, l'objectif est de proposer des voies de mécanismes de fonctionnement de plus en plus développées. Lorsque j'ai une idée, celle-ci doit contenir toutes les alternatives de sa réalisation. Une idée ne doit pas être abstraite; elle doit avoir un sol, des murs, des ouvertures. Je ne me préoccupe pas d'enseigner toutes les techniques afin que les étudiants développent leurs connaissances. Je me préoccupe, par contre, de développer ce processus de réflexion autour d'une idée et de ses images, de sa concrétisation, de la capacité d'imaginer des materiaux. Le rapport du dialogue et de la critique entre une image vague et abstraite et sa concrétisation permet de développer un dessin.'* Siza, Á. (1980), 'Interview', *l'Architecture d'Aujourd'hui*, no.211, 10/80, p.1.
2. J. Araujo and João M. Sobreira, personal conversation in Porto, 7 October 1993.
3. *Ibid.*
4. Colin Rowe's use of the word *coefficients* is best explained by the following extract from the chapter on La Tourette in *The Mathematics of the Ideal Villa and Other Essays:*

   'By cramming a Tokyo-type megaron, the church and a Poissy-type sandwich, the living quarters, into closest proximity, by jamming two discrete elements into the same volume, from the violation of a unity of conception, it has become possible, simultaneously, to manipulate all spatial coefficients.'

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Biography

Vincenzo Riso, architect also teaches as assistant professor at the Department of Architectural Design of the University of Florence. He is author of the short monograph *Álvaro Siza - La Facoltà di Architettura di Porto*, Firenze, 1998.