It is common opinion that the presumed unity of the Modern Movement in architecture is made up by an extremely plural and articulate reality of local movements. Sardinia as a case study can contribute to show the non-linear way of the relation between technology and project, starting with technology's peripheral and central areas. Already at a first survey, some evident paradoxes are pointed out: among these we find the first undeniable fact that the first affirmation of the new reinforced concrete technologies is relatively precocious and mature, even if in a low technical contents context.

If the iron technologies have reached Sardinia with late ‘800 stations and markets, in the beginning of the new century a new experimental sector that will represent one of the most expressive paradigms of modernity shows up: the RC frame, with the progressive emerging of its plot to the building surface.

In 1904–1905 Giovanni Antonio Porcheddu, Sardinian engineer graduated at the Polytechnic of Turin, after becoming rapidly the leader of Italian agents of the Hennebique patent, starts for the grain Ligurian industrials the building of the silos in the town of Cagliari, just a few years after he had built the ones in the port of Genoa (Nelva and Signorelli 1990).

The order is referred to special structures like silos and warehouses, designed with a multilevel structure with a ca. 6.5–5 m mesh, calculated after the empirical simplification of the Hennebique method. For many aspects misleading, but undoubtedly effective, it supposed that the tensions are evenly distributed in the concrete and equally shared with the iron.

The Semoleria Italiana plant is retained in Sardinia a milestone of the «engineer way» of modern architecture which will proceed on parallel never meeting tracks, full in reality of influences and contamination with other leading experiences of the Modern Movement.

Another important buyer of the Porcheddu reinforced concrete, the Banca Commerciale, was in those years busy in advertising and financially sustaining the electrification and the land reclamation. At the same time the project for the dam on the Tirso was being completed. At the end of the First World War in 1920 the final project was launched in which Luigi Kambo, engineer, transformed the work into a multiple arches dam built with local granite and trachyte stone, joined with conglomerate vaults. The great S. Chiara dam (Bitti 1998) represents a grand main point of modern constructivity. With the energy of its structures it shows one of the most credible versions of the engineering functionalism, particularly versatile and diligent in marrying the use of local materials to calculation and structural conception.

These great works live together with a technical and enterprise local net, which starting with a deliberate distance to external contributions, will hardly learn to be confronted to new technologies.
This exchange will generate results and realisations able to communicate with Italian and international design cultures.

In the following two decades this will probably be in Sardinia the main interpretation of the relation between project and construction: the dialectic between the absolutely pervasive wall culture and the progressive affirmation of the new RC frame technology, in fields and typologies of growing importance. The diffusion of technical instruments, the more refined simulation of structural behaviours of the new materials, the capillary circulation between enterprises and professionals of technological knowledge mark a slow but non-stopping decline of both patents and specialised firms. The great process starts which only the Reconstruction in the second post war will conclude: the substantial replacement of the wall with the frame in the most diffused building site and enterprise practices. It is not by chance that among many polemics in 1925 and following years the issuing of an official law for the calculation of reinforced concrete erases a great part of the patents of the new material; a few years later in 1933 the Società Porcheddu is winded up (Iori 2001).

In the ocean of conventional building a steady red thread joins the great scale infrastructures experience with the following one of reinforced concrete in urban buildings, especially in the town of Cagliari. It concerns the association of traditional wall shells and RC structures: among these last ones, the floors seem to be already diffused in the ‘20s, while just starting in the ‘30s the exposed beams show up, and the pillar are almost always hidden in the wall. Some interventions made by the Società Anonima Italiana Ferrobeton are in this sense emblematic. Leader of the public orders in the period between the two Wars Ferrobeton weaves a strong alliance with some of the local technicians, first of all with Flavio Scano, owner (together with his colleagues engineers Binaghi, Pacca, Fadda and Tonini) of the first professional bureau able to control the RC technology. Due to this alliance are some of the very first private and public buildings starting in town between the two Wars the new season of reinforced concrete. In 1929 the Caserma dei Regi Carabinieri is designed with a
massive wall shell decorated with refined concrete stone finishes. The facing, scanned with classicist pilasters, declares in the monumental corner solution with four columns the hidden pillar which is revealed mostly in the great Hennebique double beams plot.

In the choice of the most updated European references the solid plastic constructivity of Behrens in Vienna is taken as model. It is proved by a corner solution designed in the late '30s by the engineers Fadda and Tonini, designers that expanded their action radius to the management field. The two engineers already having, ten years after, a prime role in the reconstruction of Cagliari in the second post War, perfection the «mixed» structural scheme, with RC hidden in bearing walls, and used as a prime material just in the execution of floors (Loddo 1999).

It is symptomatic that in this private building we find the same type of concrete reinforced hollow blocks floor Berra, with triangular sectioned hollow blocks, that were already used in public works such as the Albergo del Povero in 1934 (Sanjust 2001) recently revealed by a restoration run on the 1935 primary school by Arturo Miraglia in Fertilia (the last new town in Sardinia).

The vicissitude of the fascist new towns introduce in the regional architectural panorama further stimulations to develop project and construction towards modern experimentation. In 1935 appears in Mussolini a new building complex thought to be the civic town centre. The Casa del Fascio with annexed tower of the lictor, and more, a gym school for the Opera Nazionale Balilla appear still today as a prototype of the lightness of European modernism, reinterpreted in an Italian/Mediterranean way.

In particular the gym is basically designed as a RC skeleton with a sequence of great portals. The relation to the wall shell is solved by the author, Giovanni Battista Ceas, with offset layers: the burnt brick striped facade marks the front, visibly advancing as to the frame wall (Pellegrini 2000, Sanjust and Santoni 2001).

Turning again on the side the brick wall leads toward an open swimming pool, framed by two portals more than 20 m wide which condense many of the experimental contents of the building. They are built with RC and have a U section, with the hollow on the lower side: the extreme thinness of the section is contrasted by the resistance given by the form and by a calculation hypothesis that foresees the execution of a simple support at the extremity, with sliding trolleys, of which the designer gives the executive project.

Not all secondary tensions though have been adequately calculated as an extremely thin intermediate cement pillar (coated with burnt bricks) shows by now heavy damages (Sanjust and Santoni 2001).

The work-line proposed by Ceas was not leaking in influences, and exactly on the topic of the relation
between wall and frame: the gym is in fact a paradigm of how the potentials of both can be used in an appropriate and «modern» manner. The author applies frame works in the design of more aerial and exceptional spaces, and appoints to the wall (not in vernacular tradition) the task of communicating with the Mediterranean light and climate. This building marks the value and together the limit of the early ’30s experimentation: great space to innovation, in the best case, but also weak incidence and penetration on the technical and enterprise field.

Furthermore, as known the international sanctions which paralyse or re-dimension high tech products importation, mark after 1936 the division between the expansive phase and the autarchic retreat. The new autarchic architecture will consequently avoid an integral use of RC with the employment and the reinterpretation of local stone walls and reserving iron and concrete especially to horizontal elements.

Due to one of the paradoxes that after all represent a constant in Modernity, some of the most original contributes are produced in this phase on the topic tradition/innovation, local materials/modern languages.

In Sardinia this experience will be put into realisation in an accomplished way first in Carbonia, starting in 1938, and right afterwards in Cortoghiana in 1940–42.

The initials of the same enterprises that use to dominate the building market in the late ’20s recur in the building contracts for the two new coal towns.
Ferrobeton for instance will construct buildings designed by Eugenio Montuori, as well as the enterprise belonging to the engineers Fadda and Tonini (who just terminated the corner building in via Pola-Cagliari); both are to be found again ten years later in the building contracts for the INA Casa in Cagliari, representing the first building enterprise of the Reconstruction.

Carbonia, giant contextual and accelerated building site of many thousands of lodgings is the real experimental field of the low cost mass building that will be realised in Italy just after the Second War.

The autarchic presuppositions are well present imposing heavy restrictions during the works:

«many adjustments are to be noticed . . . suggested and imposed by the difficulty of finding the necessary building materials to carry out the works as designed and contracted».

The contracts for public buildings do not foresee the use of a bearing RC structure, which application is hasty limited to «parallel or cross ribbing slabs with special or hollow blocks».

Very much detailed descriptions are reserved to walls, especially to face walls. The result is a «minimalist» building panorama, assuming great interest and suggestion where, once again, a non-vernacular use of the wall is achieved.

Some of the most successful residential types, among which are Montuori’s, Lenti’s and Di Tomassi’s houses, are based on the combination of the pure prism of the building and the trachyte block walls crossing it in the only possible way: with the external staircases.

Cortoghiana is founded as a more circumscribed urban entity, with a very rational and rigorous design invention. Saverio Muratori catches in this case one of the most important aims of the Modern Movement for which «less is more». He works following typological and morphological rules, with very much calibrated exceptions: an exact and strict grid that ladders in the centre to host the Piazza Venezia; a few building types: one is represented by the line houses with arcade following the great central square, the second by the little two-family two-storey houses defining Cortoghiana’s margin to the countryside. The same coherence avoids any vernacular implication in the use of local stone, in the traditional striped and plastered wall, in the pitch roofs. An autarchic answer is to be found, except in those typologies deliberately lacking overhangs, also in the arcades where the trachyte stone abutment and its 3 m width (the dimension, referred to a height of 5 m gets close to the rule of three) allow a maximum economy on the RC architrave carcass. Moreover it becomes the formal language of the metaphysical Piazza Venezia, realising a paradoxical and obsessive iteration which transforms the arcade from a classical motif to a metaphor of modernity.
construction, of the traditional building procedures, through a very dry design.

The passage signed by the War does not act in a decisive way on techniques, but changes the background scenario, focusing on the quantity and quality of the building production. The expansion politics of the «new towns» enter a quick and irreversible crisis, while the development of urban peripheries gets re-launched to incredible rhythms, also promoted with a public intervention for popular and mass lodging.

Building assumes at this point a precise anti-cyclic role, and gets the task to work as a flywheel for the labour (assuring at the same time the re-conversion of rural work into the most recent industrial processes). It is also therefore functional that it stays in an intermediate status between the craftsmen building-site and the most advanced industry. During the post War Reconstruction phase the same enterprises which in the ‘30s had experimented the passage to autarchy (in the meantime they had also achieved mass methods and techniques) use more and more frequently «new» RC frame technologies, from which each character of exception is now removed in order to be reinserted among the current building practices. Once again a decisive technical, cultural and
organisational passage is carried out by the designers of the roman school, called to direct the great building-sites of the INA-Casa programs.

An example in this sense is the progress of the designs and realisations in Cagliari by Adalberto Libera, Maurizio Sacripanti and Enrico Mandolesi.

Since 1950 the recognised leader of Italian Rationalism and main designer of the INA-Casa, Adalberto Libera, projects the garden-suburb in via Pessina-Cagliari following criteria of great pureness referred to the language of frame architecture. Beneath the white skin of the plaster, the traditional limestone masonry shows up, as documented by archive pictures, while just floors were built with reinforced concrete. The first building site images showing a RC frame are dated in the mid ‘50s and are referred to the intervention of the INA-Casa in the north of Cagliari: a whole quarter, Is Mirrionis-San Michele is built with the new building system, and more it is the first case in which the social building is occupying an entire portion of town, influencing the enterprises in the following decades. The two complexes, built almost at the same time, well expresses some of the different possible declinations of the rational post-War language: opposite to Libera’s clear plastic setting of the compact volumes is Maurizio Sacripanti’s decided will to work on the tectonic «showing the frame» (also after Ridolfi’s and Quaroni’s contemporary experiences). Sacripanti will start a true battle run on telegrams and letters to induce the enterprise to build the exposed frame with the complicated profiles as foreseen by the project to express the different tectonic role played by supports and beams (Sanna 2002).

On the other hand Sacripanti will also design for his «towers» a local stone facing basement.

At the end of the ’50 the younger Enrico Mandolesi, founder of a new school of design at the University of Cagliari, in the project at La Palma sets himself free from any local reference and transfers without regret Ridolfi’s style with face frame and brick infill.

The two building site types (stone and RC) bring us back to the role played by the residential building in the Post War period in reconverting traditional crafts into new technologies. In very few years a whole organisational and productive universe gets upset and reshaped in function of mass building. It is in those years, for example, that the local building industry gets reorganised to produce the new burnt bricks
necessary to the renovation of the building system. The major furnaces (equipped since the beginning of the century with Hoffmann ovens) grow bigger, open new factories, get ready to improve the production 4–5 times especially concerning hollow bricks and floor blocks for beam and block floors.5

In Sardinia, the dialectic tradition/innovation, maybe more than elsewhere, hinges on the weave between handcraft and industry, local- and import materials, new and old crafts, urban and rural dimension. Therefore in an area that apparently seems not having experienced in front line modernisation, some of the essential premises of the architectural debate are embodied sometimes in an exemplary manner.

NOTES

1. The show up in Sardinia of the Ferrobeton coincides with the decline of both Banca Commerciale and Gruppo Elettrico joined to it, and with the affirmation of the Credito Italiano (to which the Ferrobeton is joined) that takes progressively its place (Di Felice 2000).
2. Relazione al conto finale del Lotto 23–23/35, IACP Archive, Ufficio di Carbonia. In a similar document, referred to the Lotto 28–28/35 an «hyper-autarchic» variant is described: «the eaves’ frame expected to be realised in RC was then modified and made out of bricks as imposed by the rules given by the Ministry for Public Works on the minimum reduction of metallic material» (Sanna 2001–2).
3. Capitolato Speciale d’Appalto of building types A. K and Di Tomassi, both attributed to Montuori (Sanna 2001–2).
4. It is a true «war building», that has to be built without
The new social housing by Enrico Mandolesi in Cagliari-La Palma (1957–’58)

iron: a letter by Provveditorato alle Opere pubbliche dated 17 April 1940 states that of 300 q of iron materials just 30 were allowed by the Ministry!” (Sanna 2001, 123).

5. In this way in the hinterland of Cagliari some new production plants are installed as Scanu in Assemini and Picci in Quartu, bound to mark in the following decades the universe of building base-materials (Sanna 2002–1, 152).

REFERENCE LIST


