

APPLICATION OF SUSTAINABILITY CRITERIA IN URBAN MULTIFAMILY MEDIUM SCALE: REPORT OF TWO CASES IN BUENOS AIRES, ARGENTINA

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ABSTRACT

This paper presents two case studies of urban middle scale buildings destined to multifamily housing, in which the primary objective taken was the envelope design and selection of materials according to criteria of energy efficiency and sustainability in general. Both were the result of a collaboration between an independent architecture office and research centers of the Faculty of Architecture, Design and Urbanism of the University of Buenos Aires, which provided advice in the area of technology related to project and design. In the first case, the advice focused on the envelope design to improve their hygro-thermal behavior through compliance with the value of u together and the protections and adjustments of openings to guarantee the sunshine of the houses, and the solar thermal installation. In the second one, waste management for direct application of demolitions at the working site on new materials that contribute to reduce the transportation energy expenditure and to the thermal capacity of the envelope was incorporated.

The originality that presents the paper lies firstly in the selection of the case studies: typical buildings of the City of Buenos Aires, built without exceptional budgets or conditions. Contrary to some prevailing trend in the practice and study in this field locally, it is proposed to shift the debate to the concrete possibilities of promoting sustainability in urban architecture, and provide casuistry in this regard. Furthermore, the two cases realize modes of articulation between academia and public research and private enterprises, unusual at this scale. It is noteworthy that the research projects that directly and indirectly relate to assessments that provide technical solutions and innovations to the works (such as the design and production processes of the blocks cementitious aggregates coming from recycled materials) are formed by teams led by university professors, and graduate and undergraduate students.

The case studies analysis emphasizes the issue of selection, production and materials management with sustainability criteria, within the theoretical framework of materials, environment and health. This is another point that, within this area at the local level, has not received the necessary attention in terms of dissemination of information, legal frameworks, or protocols of implementation.

Keywords: materials, sustainability, building envelope, Buenos Aires, recycled waste.

1.- State of affairs

In Buenos Aires and in Argentina in general, the application of sustainability criteria in architecture is an emerging field, with relatively few examples built to date. On the other hand, most of the examples made, and in general the study of this field ranges from cases of small isolated buildings that require a high level of energy autonomy, and building complexes or high-scale towers -usually with administrative or commercial uses- in severe need of reducing their high energy demand. However, the vast majority of buildings in cities such as Buenos Aires lie between these two extremes. In Buenos Aires, as in many other cities of Hispanic origin, with traditional compact urban fabric, mostly made up of buildings between party walls, four to twelve stories and fronts that match the old ten Spanish *varas*- most buildings have immediate access to urban infrastructure and service networks. In these cases, the question of rational and efficient use of energy should not necessarily aim for energy autonomy, as if they were isolated rural buildings. Nor is completely assimilated the problems posed by large-scale urban buildings that have other resources that enable the development of complex infrastructure. The medium-scale urban buildings pose specific problems and solutions and also require specific regulations. This paper proposes to focus the analysis on this type of building, typical of the City of Buenos Aires, in order to redirect the debate toward concrete possibilities, feasibly to be made without exceptional budgets or conditions, specific possibilities for promoting sustainability in urban architecture and provide casuistry in this regard.

2.- Objectives

- To promote the debate regarding possibilities of application of sustainability criteria and strategies in mid-scale urban architecture in cities of characteristics such as Buenos Aires, feasibly to be done with the usual technological and budgetary resources on this scale, and within the existing regulatory framework.
- To present built cases that incorporate sustainability criteria in the selection of available materials in the local market.
- To introduce innovative processes in the design and manufacture of new materials made with the inclusion of on-site recycled waste at the building work location, which among other features, provide thermal insulation capacity to the building envelope.

3.- Selection Criteria [1]

Given the local technical and legal gaps, a synthesis of a number of criteria at a general level is presented, which without being definitive, enables a selection of materials beyond economic, market and policy variables, graded from *Design standpoint, Impact over time, Life Cycle and Attributes*.

With regard to *Design*, in both new construction and intervention in the built stock, it is essential to contemplate the analysis and use of dismantled, deconstructed and/or demolished elements in a work, as well as the possible referral to another one. It is also important the study of recent and obsolete technologies in order to verify the compatibility between existing and new materials and the detection of materials that are currently considered harmful (e. g. asbestos) and its treatment and/or removal with safe procedures before an intervention that may disturb them.

Regarding the *Impact of the materials over time*, it is important to address issues relating to the protection and preservation of the environment. Regarding the *Life Cycle* (raw material procurement, transfer and processing, application and/or installation, use and disposal), the general approach is to study each stage of the material, product or item, individually and in their interaction at work. Within this

framework, the priority is to assess the origin of the raw material (animal, vegetable or mineral), and the impact on the environment caused by the extraction volume and methods; the energy and water used in the manufacture process, the transportation and processing, and the design and packaging innovations considering these issues; to test for contamination (including sound) at the time of application and/or installation on site; to verify the impact and harm the health of users; to choose materials that facilitate the reduction of the volume destined for final disposal and support possible reusability, replacement and/or recycling.

In the XXI century, the reflection on the “Useful Life Cycle” experienced a shift that can be best summarized with the passage from the concept of “Cradle to Grave”, which highlighted the need to minimize the impact of waste, to that of “Cradle to Cradle”, which calls for a virtuous cycle in which all material extracted from the earth returns without significant negative consequences, reissuing the biological cycle of nature.

As to *Attributes*, it is primarily necessary to know the chemical composition. Materials with toxic substances or pollutants can cause degradation of ecosystems and offer little or no possibility of recycling. A derived attribute of the composition is the reaction to fire. For example, there are raw materials that in their natural form can burn without polluting, but when they are processed with chemicals that enhance their properties, the contact with fire may cause the release of toxic emissions. Moreover, it is desirable to use non-flammable, but if they are not, provided security protocols should be ensured; it is important to distinguish between flame retardants (that do not propagate flame nor release toxic emissions) and self-extinguishing (which do not release flames, but emissions), as well as the chemical composition of undergoing flame-retardant treatments.

It should also be taken into account the (bio) degradability (capacity of the material entering biological or chemical decomposition) and compostability (biodegradation under specific conditions), properties that facilitate the return of the material used to the earth. Other *Attributes* also considered are: quality and performance; improving indoor air quality; conservation, energy conservation and energy efficiency and durability.

4.- Methodology: case-study approach.

Selection and production of materials with sustainability criteria in urban architecture: analysis of post-occupation and initial construction phase cases.

As already mentioned, in our country there are virtually no certified materials nor local environmental certification systems in line with our legal framework in place – although there are initiatives and studies with this purpose. Available materials and building products fluctuate and are conditioned by public policies, economic conditions, availability of natural and technological resources, ability to import and domestic demand, among others. In this context it is proposed to examine built cases in which both design and materialization in work decisions were intended to achieve the highest possible levels of sustainability, as it is argued that, even in a context that does not facilitate sustainability practices, it is possible to achieve significant improvements.

Through two case studies the results from the addition of these criteria in the selection of materials, recycling of construction and design operations in urban multifamily housing in the context of average density of the city of Buenos Aires are set out, together with the network linking research between the CIHE, the CEP and professional practices. In the first case it is a finished building which design involved various studies on energy efficiency and sustainability in urban architecture, mainly nourished by the CIHE research. The second case, currently at the start of its

construction – not only does incorporate the strategies implemented in the first example but also the approach of the CEP in terms of *in situ* production materials. In this sense, from a local building tradition based on the use of masonry, this project investigates and develops mixed concrete for masonry which incorporates both selected and processed demolitions moieties as recycled material which previous use is not necessarily linked to construction – substantially improving their thermal properties, and reducing the carbon footprint caused by the transfer of materials and use of virgin products. [2]

5.- Working Hypothesis

Through the detailed study of the construction process and the materiality of local cases – in which the application of sustainable-architecture criteria was a central aspect of the design and building processes – it is possible to determine both the limits and grades of sustainability that are achievable in the building sector in Argentina in terms of materials produced and/or used.

6.- Case Studies

6.1.- Aráoz Building

The operationalization of the working hypothesis raises the convenience of adopting a methodology based on real case studies. The best proof that it is possible to build a medium-scale residential building that manages to incorporate strategies and resources for sustainable urban architecture –with the constraints and possibilities of a specific context (in this case, the city of Buenos Aires) – is the proper realization of existing built cases, and their examination.

6.1.1.- Construction and post-occupation process analysis

It is a four-story building, designed according to sustainability-in-urban-architecture criteria. The project was led by Kozak Architects, with a consultancy on sustainable construction from Evans-de Schiller Consultants. The building construction began in February 2011 and finished in February 2013. Currently, all the units are inhabited. The building is located in neighborhood of Buenos Aires where it is allowed to build up to five-story buildings. Among the issues that were taken into account, special attention was paid to the, possibilities determined by the characteristics of the urban fabric and planning regulations, as well as the local climate, technological resources and economic constraints of a building which above all must meet the expectations and possibilities of real users [3].

6.1.2- General characteristics of the building and construction process

The resolution of the apartment's floorplans and the location and design of windows and sunshades sought to optimize the capture of direct sunlight in wintertime and ensure the necessary sun protection in summertime, to avoid over-heating effects(Fig. 1). On the pre-existing party walls adjacent to the neighboring buildings - common brick with 45cm thick in the ground floor (GF) and 1st floor- it was sought to adopt a detail that would achieve the lowest possible value of thermal transmittance without excessively increasing the thickness of the wall. The solution adopted consisted of: common solid brick on the outside, plus 5cm of projected cellulosic insulation, a polyethylene film 200µm vapor barrier, and rock-plaster plates in the inside (Fig. 2). The exterior walls were built with hollow brick 18cm plus 5cm of projected cellulosic insulation and rock slabs gypsum in the case of the bedrooms onto the patio. In the bedrooms and lounge, exterior walls were built with reinforced concrete partitions of 15cm thick, plus 5cm of high density EPS and solid brick walls. On the terraces high density EPS insulation was also adopted and the ceilings under

slab in the GF used glass wool (3 cm) plus the accumulation of EPS received in the work as packaging products and supplies (Fig. 5). All the windows of the building were equipped with double glass airtight and -except in kitchens- anodized aluminum blinds with injected polyurethane.



Fig. 1 “Ground Floor, 1st and 2nd Floorplan Aráoz plus Sunlight study”. Source: own elaboration

The apartments have winter-summer air conditioning units with *multi-split inverter* system which use low environmental impact refrigerant fluids; the water condensation is recovered for the garden drip irrigation system.



Fig. 2 “Application of projected cellulosic insulation”. Source: own elaboration

The sanitary equipment includes dual flush toilets and faucets with aerators to reduce the water consumption. There is a system of solar collectors with evacuated tubes that transforms the solar radiation into thermal energy to heat water for consumption in order to achieve an annual average energy saving in the order of 60%. The common spaces are lit during the day using natural light and with low consumption artifacts driven by motion sensors and photocells at night. In the GF it was sought to maximize the surface area of permeable ground and spaces at different levels for the practice of urban organic agriculture were allocated. Part of the GF was reserved for a bicycle parking lot with easy access, promoting sustainable forms of mobility (Kozak *et al.*, 2013).[3].

6.1.3 Materials in the finished building today

On the 1st and 2nd floor, a wall of reinforced concrete resolves the sunscreen protection (in a NW facade) with horizontal and vertical sunshades that form a single continuous element. Vegetation is used as part of the sun protection strategy and as an air filter as well. On the 3rd floor, sun protection is solved through vegetation on tensioned cables and a timber pergola. In the central courtyard, a screed of semi-permeable paving of concrete paving stones interlinked is alternated with absorbent surface of pellets in the vertical circulation core side yards. On the free party wall and in front of the elevator, a strip with substrate for the growth of climbing plant species set out on a metal mesh, contributing to improve the quality of air and lower temperatures in summer. The openwork walls – built with the cobblestones of the flooring – are used to separate the space for the parking of bicycles and the edge of the garden. The bottom substrate, elevated and contained by low walls, allows greater absorption of rainwater, growth from more deciduous plant species, and avoids drag and clogging storm drains (Fig.3). The metal mesh and stonecutters in each level hold the vertical garden, whose purpose is also to provide protection to the elevator and prevent rainwater from entering the passage (also "cattle" grates are disposed against the elevator to that end). Artificial lighting in the stairway and bridge is activated by motion sensors and photocells.



Fig. 3 “Patio and circulation spaces with vertical gardens”. Source: own elaboration

The kitchen furniture is made in MDF covered in white melamin with aluminum hinges. As a continuation of the countertop, through horizontal oblong windows, beds for individual gardens add thermal insulation to the exterior walls of the kitchen. In the dividing walls facing NE, glass bricks increase the natural lighting of the main venues of the departments in the 2nd and 3rd floor.

The walls and ceilings (with reinforced concrete slabs in sight) are finished with white water paint. The terraces viewing the garden also have a structure of tensioned cables and wooden pergolas to support the growth of vines and climbing plants to provide sun protection in summer, reduce the input of particulate matter and improve interior air quality throughout the year. In the courtyard bedrooms, front solar NW protection is resolved by the setback of windows, which create an interior space with the possibility to assemble equipment, such as shelves, eventually removable and reusable.

6.2.- Olaya Building

6.2.1.- Preliminary analysis and on-site recycled materials production.

It is a five-story building, in which the design details and overall concepts in terms of sustainability in urban architecture were similar to those applied in Aráoz Building (Fig. 4). The main innovation in this case was given by the on-site production of masonry from recycled materials, and on this particular point is focused the analysis of this section. The project was carried out by Kozak Architects with the a consultancy on Waste Management by Marta Yajnes and Susana Caruso Architects. The construction of the building began in August 2014 and it is scheduled for completion in August 2016. The building is located in Villa Crespo neighborhood, within the same zoning of Aráoz Building case.

The pre-existing construction was found in poor condition. Its original core, built in the 1930s, was much intervened and altered. The main constructive system consists of common brick walls seated with poor mortar with lime as the main binder; thickness of 45cm for walls, 30cm for front walls and patios and non-bearing divisions of 15cm. The ceilings on the ground floor (no upper floors) have a structure of 'double T' metal standard profiles and vaults of common bricks revoked with metal roofs.



Fig. 4 “Exteriors”. Source: own elaboration

Subsequent interventions densified the courtyards with low-ceiling small-size rooms, built with hollow brick walls 8cm thick, settled with rich cement mortar and revoked. The roofs show a variety of typologies, including reinforced concrete slabs and slabs with ordinary bricks. This type of construction, very common in the city of Buenos Aires, today presents an important inadequacy to current regulations, such as those on electrical safety, room measures, lighting and ventilation, moisture conservation and significant building deterioration. As a result of the application of these indicators it is necessary to demolish the existing building for the development of new proposals. [5]. The re-use of demolished materials is a matter of utmost importance nowadays.



Fig. 5 “Demolition and recoverable items, current production system and Proposal for production model reorganization”. Source: own elaboration [6].

6.2.2.- Constructive proposal with Recycled Materials (Fig. 5)

Part of the demolition of approximately 28m³ (12.000kg) of pieces of rubble, measured in its demolition state, was reserved for its recycling and transformation from residue to resource as fat aggregation on concrete to be used for the construction of not amble blocks. As the result of CEP studies, two miscellanies were selected for the manufacture of construction blocks for exterior double walls. They are three-layer blocks: outer layer of cement mortar with water-repellent additive and ferrite derivate color, insulating core of concrete cement with sand as fine aggregate and rubble and crushed EPS as coarse aggregate, then grout cement is applied to

seal the surface to avoid shelling in handling. It was sought a masonry that had weight and measures similar to the bundles available in the construction market but featuring superior finishing, including color, shadow gaps and above all, avoiding the need to plaster and other cumbersome tasks of work both for economic investment and occupational hazards. The finishing is a coat of sealant or water lacquer for surface protection (Fig. 7)

In the ongoing investigation on the use of rubble as coarse aggregate, the additions are measured in kg, so because of that it was studied a way to measure the volume of demolition to be reserved for the future manufacture of blocks during the construction works. For this purpose a sample of debris on the ground, including all existing variations in terms of size, shape and original materials (hollow and common brick, plasters and mixtures of seat), was removed and weighed to estimate the required volume. The sample measurements indicated 24,5kg of weight, a volume of 0,0424m³, and reached a specific weight of 578 kg/m³. Then the material was crushed to pass through the sieve of 12.5mm and keeping their weight, their volume went to 0,0297m³ with a specific weight of 826 kg/m³. In another stage the powdery material was separated, reaching a useful volume of 0.024 m³, a weight of 17, 5kg and a specific weight of 728 kg/m³, it was considered that it could be used 1 kg of powdery material in that proportion. The conclusion of this analysis determined the 28m³ required to meet the need of 12.000kg. When the demolition is finished, the manufacturing of a batch of blocks with the two aforementioned mixtures will be carried on and consequently, they will be tested for proficiency in certified laboratory.

6.2.3 Production process

- On-site training work (Fig. 6)
- Preparation of molds
- Processing of recycled materials: Rubble crushing and sifting; weighed of crushed rubble;
- Crushed and sieved of EPS, crushed EPS volume measurement
- Weighed of virgin materials (cement, lime, sand, additives, colorants, water)
- Pre wetting of rubble; mixed of EPS with water more additives
- Dry mixing debris; mixed set of concrete
- Preparation of mortar for finishing with their additives and colorants
- Casting of layers
- Curing; Unmold; stowage; quality control and disposal of parts; controlled stowage
- Cleaning of the place, molds and tools.



Fig.6 On-site training work. Source: own elaboration

6.2.4 Work building process

Usually, in works such as the present case study, EPS or EPOR packaging is available in two stages: during the work from provision and placement done by the

construction company of the different equipment devices installed in the building, which represents an estimate of 2000 l of already processed material, and during the stage of moving and occupation of the departments (packaging of refrigerators, washing machine, etc.) which represent other 2000 l. At the beginning of the construction, this volume of EPS is provided from earlier works. To complete the 40.000 l estimated for manufacturing blocks exterior walls, it is proposed to establish a logistics of collection strategy with generators like appliances selling companies chains and hypermarkets, laboratories and waste collection cooperatives. It is also possible to include waste collection for recycling neighboring points like the Red de Puntos Verdes [7] in Flores neighborhood. In all the cases, the challenge is to minimize the special transfer movements given the volume of the pieces and the quantity of gaps that they present for its format. As EPS from air conditioners, kitchen appliances and furniture packaging typically comes in a stage where the construction work is nearly complete, the possibility for stockpiling for later work is presented and raises the need for a deposit.

A possible solution would be to measure the cubic length of generated EPS and to create a virtual gathering in charge of a reclaimers cooperative, where upon delivery e.g. 30m³, the cooperative returns that amount to an acquittal, running the m³ withheld as payment for transport and virtual collection. The cooperative would not keep really those m³ but it might sell them to third parties, undertaking the commitment to restore the material at the time that it is needed in the work, with a notice of agreed anticipation, as a bank works. This would create a market exchange and revalorization of waste material such as EPS. Already a link to the neighborhood community was achieved after the FADU Verde [8] intervention and the Italian Hospital [9], 2 km distant from Olaya, which weekly provides drug conservators to be crushed on site. The aspired goal in Olaya's work is to cover the enclosure of street fronts, garden and patio with on-site produced blocks, completing the virtuous circle of raw material procurement, storage, preparation, training, molding, stowage and put into use, all within the same work, aiming to decrease considerably economic and environmental costs.



Fig. 7 "Different parts of the blocks system and color tests". Source: own elaboration

6.2.5. - Justification of crushed EPS incorporation in the mix for blocks

Conventional mixtures, obtained from the addition of crushed rubble and coarse aggregate, generate specific weights hardly fall of 1300 kg/m³, which is unsuitable for the purposes of obtaining competitive products in weight and thermal insulation. From the SI TRP19 Project research, different results with EPS formulas that combine crushed and rubble were obtained. Within the range of available mixtures, for this project were preferable those which have a pasty binding, preferred by the contractor for its workability, with densities of 900-1000 kg/m³, called TRPN 1 and No. 10 with variations from 300 kg/m³ to 325 kg/m³ in the input of cement, sand and rubble and EPS coefficient between 3.75 and 3.25 times of EPS in liters on the cement expressed as kg. The dosage is 1: 1: 1: 3.25, corresponding to cement, sand and rubble respectively in kilos and EPS measured in liters. Every soul block 12 cm

thick contains 2 kg of cement, sand and rubble and 7.5 liters of additivated EPS. The superficial faces correspond to the cement mortar 1: 3 to 1 cm thickness in the outside and 0.5 cm in the inside. The walls will be double, completed with insulation layer of insulation and plasterboard termination of rock to reach a U-value of 0.60 to 0.70 W / M2C. A wall built with a block 13 cm thick has a U value less than 29% that of a ceramic block according to own calculations based on tabulated values according to Local Regulations and to the following reference: <http://www.lapastoriza.com/images/el-bp12-transmtermica.pdf>

Material	Quantity	U	Roundtrip transportation construction site to dumping site (Km)	Quantity of Dumpsters	Dumpster Load cost	Fuel consumption (liters)
EPS	50	m3	240	15	15	48
Rubble	12	m3	48	3	3	9,6

Table 1 “Estimated Footprint of EPS and rubble produced at work site, if they were discarded”. Source: own elaboration

Regarding EPS, the recycling of this material developed a dynamic in recent times which makes modify the gaze on this input. The Government of Buenos Aires City (GCBA) incorporated it within the materials received in its Green Centres and there are companies or individuals that already grind and trade it, reaching a sale value similar to sand. In the Olaya case the EPS will be on-site grounded, which will create jobs and eliminate transportation costs and intermediaries (Tables 1 and 2).

Material	Quantity	Unit	Transportation to the factory or extraction site (Km)	Transportation from the materials depot to the working site (Km)	Fuel consumption (liters)
Bricks	6000	un	150	20	34
Cement	760	kg	1400		
Lime	1360	kg		20	33,24
Sand	7,2	m3	300		

Table 2 “Estimated materials and fuel for 400 m2 hollow bricks with thick plaster outer wall footprint”. Source: own elaboration

6.2.6. - Block tests

Three blocks were tested at the National Institute of Industrial Technology (INTI) to Compressive Strength, with results average of 3.10 Mpa, resulting suitable for the construction of non-bearing walls (Figs. 8).

In the near future the blocks will be tested to Water Absorption, Compressive Strength for Walls and Rainwater Permeability.



Fig. 8 “Compressive Strength tests performed in the INTI, Argentina”. Source: INTI

7.- Conclusions

7.1.- The Aráoz Building

This Case Study was conceived from typological studies in the regulatory legal framework of the GCBA and sustainability criteria with emphasis on energy efficiency, supported by analysis of sunlight, building envelope and renewable energy, which in addition to the utilization and reduction of water consumption and the incorporation of vegetation as a structural and inseparable part of the project as a whole, the observation of the finished building and one year of its operation allows to detect compliance with regard on design, life cycle, materials footprint in time and desirable attributes. The criteria in practice are interrelated, then a score which verifies the use of:

- Local / Regional Materials, reduce transport distances, and consequently, pollution and energy expenditure as well.
- Traditional materials in the local market, which are usually of easy replacement.
- Materials of good quality and performance.
- These advantages bring with others such as the possibility of recycling in partial or total demolition.
- There are few fixed elements and all of them provide the possibility of Removal, Disassembly, Repair, Replacement, Reuse and Recycling.
- From the point of view of the chemical composition, the materials used have low or zero toxicity.
- Indoor, nonporous surfaces of floors, walls and micro-concrete countertops of do not accumulate dirt and prevent the proliferation of microorganisms (bacteria and fungi from moisture), which is also favored by the lack of joints and abundant daylight and ventilation in all rooms.

7.1.1. - Unity and interaction between organic and inorganic matter criteria:

- The ornamental, climbing plants, vines and Orchard, improve the quality of air in general building and units in particular.
- In expansions with pergolas and structures for growing vines and creepers a natural barrier is created to filter the air, reducing the entry of outside contamination and creating a microclimate that improves indoor air quality, which passes from the expansion to living rooms and bedrooms.
- The same applies to the stonemason for the kitchen organic orchard, of much greater dimensions than simple beddings.
- The building is self-sufficient in irrigation water through devices and hoses connected to draining of thermal conditioning equipment.

7.1.2. - Indoor air quality and Reaction to Fire:

- Except MDF equipment (which locally has VOCs containing binders) and melamine (no sustainable synthetic material but easy to clean and difficult to substitute in the local market), there is little or no possibility of burn.
- From these two points, plus external circulation and profuse ventilation units, can be inferred that the risk of burn is minimal and according to their materials, there would be very good reaction to fire.
- There is presence of glass wool, less sustainable, and EPS and polyurethane, non-sustainable, but all these materials are confined within walls and floors, and covered by nonflammable materials in case of fire. Their replacements in the local market are dashed by fluctuating importation of other materials as well as the eventual difference in costs.

7.2.- The Olaya Building

In this case study, in addition to meeting the criteria noted in Araoz, innovative aspects are incorporated such as:

The use of recycled material:

- Part of it, from the demolition done on-site.
- Manufacturing has the support of studies and trials at INTI which verified fitness for a building of its kind in the city of Buenos Aires.
- The use of the system of concrete blocks from recycled aggregates, custom made.
- These blocks can be designed and manufactured tailored to the construction requirements in terms of dimensions and joints.
- The usual situations of cuts of parts are reduced and so their correlative emission of powdery material and waste generation.

Finally, sustainability and selection of materials is a matter of design, in harmony with the environment, the sun and nature, towards the quality of life of people and the preservation of our unique resource, the planet.

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