Recovery and maintenance of the building complex used for tobacco manufacture in Cava de' Tirreni

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Abstract

The case of the tobacco manufacturing site in Cava de' Tirreni (Sa) will be analysed to describe the complexity of intervention choices for buildings in which there has to be a change in the use destination; its new destination will be the settling of a pole of the Faculty of Architecture, University of Naples "Federico II" and of activities connected to a sustainable tourism promotion. The building was built as a patrician house (1524), it then changed different use destinations, until 1912 when it was transformed to an industrial site, specifically in tobacco manufacturing which today still represents the building's prevailing feature. The actual configuration derives from relevant interventions in the 1900s for the manufacturing activities' need and is distinguished by the introduction of new techniques and new materials; because of all of these features the site is an example of industrial archaeology. The definition of reuse interventions requires the preservation of relationships within the pre-industrial building as it was shaped after the changes in the 1900s, to guarantee the preservation of evidence of different ages' material culture and maintenance related to the new use. The proposed contribution defines guidelines for the planning of the interventions that have to be carried out, when processing the reuse project for a building, in which the need to govern and at the same time the choice of materials and traditional building techniques is connected to the durability prevision and the behaviour of a building system subject to new use.

Keywords: sustainable reuse, maintenance, technological features, industrial architecture, pre-industrial buildings.

1 Introduction

From the Industrial Revolution, the introduction of new technologies in the building segment, brought, throughout XXth Century, the use of building materials and elements with different features from the "traditional" architecture.

These technologies, other than having determined the total obsolescence of pre-industrial building systems - for economical and safety reasons and for their compositive potentiality - were largely used for transformation of the existent building heritage. In these cases, there are problems due to the limited knowledge of durability performances and to the behavior of new building systems and materials, together with difficulties in the integration between new technical elements and pre-existing building structures. The buildings are transformed with different technologies connected to different ages. In fact, the different technologies overlap and cross the pre-existing in a new complex system that becomes a strategic element for choices connected to the project.

Buildings that had already gone through significant transformations in the past present complex problems when they have to deal with interventions for their obsolescence conditions, in fact there is a double requirement: preserve a single building's elements and at the same time, preserve whole parts that form, today, a unitary system [1].

The more frequent mistake is to ascribe different values to single parts, not considering the actual building configuration as a unitary, balanced element. In detail, interventions realized in the XXth century, are recognizable for the use of new materials different from the traditional ones, or for the new use of traditional techniques and materials. These interventions have an implicit "fragility" due to the not yet experimented materials' and techniques' perishability and to the non-acknowledgement of their value when not realized by famous planners. This is the condition of industrial architecture, often the object of interventions done because of the impossibility of preserving the use destination for the fast development of handcrafts processes and for the radical change of production requirements, or for the growth of the economical value of areas that were considered in the outskirts and that, today, for urban expansion are considered center city.

Re-use interventions for industrial buildings of XXth Century, have to search for a balance between preservation and transformation with the aim of preserving the building's identity. In the case of traditional buildings that were modified in 1900 for requirements connected to the factory output, it's necessary to define intervention choices on a base of analysis of a new balance condition the building reached. This balance condition requires the due consideration of the role of materials and technological elements of different building techniques. Interventions that erase the 1900 traces, would impoverish the building's identity changing its testimonial value in the succeeding of different use destinations linked to the local communities' events.

The building choices and the realization modalities of the 1900 interventions have often produced a fast decay process that was sped up by the inexpensive materials featured by industrial buildings of the past, and by the difficult

integration of traditional building systems and elements realized with new materials and new technologies.
The reuse project, in buildings that present a combination of technologies, has to adapt the pre-existing to the new function, guaranteeing preservation in time of all its elements for the presence, together, of traditional and post-industrial technologies.

2 Tobacco manufacture in Cava de' Tirreni

The study case gives evidence of the events of Cava de' Tirreni: the building, born as a patrician house in 1524, became a monastery in 1600 and finally, an industrial site at the end of 1800.

In this period "Borboni" establish Legal Monopoly, choosing Cava de' Tirreni as the only site for tobacco cultivation and, in 1912, the building was used for the manufacture activity connected to this cultivation. After this change of its use destination, in 1900, the building undergoes consistent and significant transformations so that it appears today as an example of industrial architecture, symbol of local economy and of the productive past of the city.

Recently Cava de' Tirreni assumed a role of cultural and scientific pole, holding teaching structures and forecasting the building's reuse as a University. Besides, in the last years, the city became the center for a different kind of tourism, an ecological kind of tourism in contrast with the already present mass tourism of the Sorrento coast. The building, that is today unused, could have a double function: on one hand the one of cultural pole, hosting the University of Naples "Federico II", degree in Building Science and Building and Urban Management and Maintenance, already in Cava in a temporary place; on the other hand the one of tourism and land promotion pole.

The integration among various activities is necessary to guarantee the intervention's sustainability and to promote a strategy orientated, on one hand, towards the allocation of the functions that guarantee the financial bearableness of the project (driving functions) and on the other hand, towards those functions that satisfy the local needs, that alone would not be able to support itself.

The strategic model that represents this development idea is made up of a joining nucleus, that co-ordinates and fuels the two complementary functional sectors: driving functions, economic profile; driven functions, to consent and to satisfy local needs.

The considerable physical consistency of the building in examination, the complex morphological articulation of the building, the strategic roles covered within the urban contest, caused the necessary examination of the functional systems.

The acknowledgement of the proposal pointed out the necessity to allocate, new activities in the economic and vocational training sectors. Beginning from this demand, two distinctive functional systems were hypothesized.

The main idea is to create a pole, that constitutes a central engine that fuels and transforms the induced deriving from the grouping of the functions. The hypothesis has as driving function all the activities connected to a sustainable tourism promotion constituted by: training and refresher courses in the eco-tourism and environmental areas, management and information point on the activities of the nearby WWF Park, general tourist info-point (hotels in Cava, public transportation, events schedule, museum information, etc.), meeting room for connected activities, promoting handcrafts.

On the other hand, as driven functions can be considered all the activities connected to the University programs and courses. Due to the nature of the University programs, the two functions can be perfectly connected creating a synergy among the settled activities. In fact, the degree in Urban and Building Maintenance and Management includes, in its programs and courses, disciplines aimed to the land sustainable development and ecology.

Despite the preservation of the old court-building plan, the space distribution organization and the morphological features were strongly marked by the industrial destination so that almost only the traces connected to this function are observable today. The prospectus architectonic features are the result of the transformations the building underwent after the creation, in 1900 of the square and the public gardens, that required the re-planning of the urban scenery.

The principal prospectus is featured by an ashlar basement with a big relief, a facing with clews fixed at one end only, a coping with a shelf and a liberty style, steel and glass main door. The plane coverings are interchanged with flap coverings with tile mantle.

The basement still holds yellow tufa stone wall structures and space configuration is determined by modular areas with barrel vaults that reproduce a structural connection, realized for considerable loads for the manufacture activities. The risen structure is composed by full masonry in yellow tufa stones in alternation with reinforced concrete pillars built in 1900.

The slab floors as well, are featured by a variety of techniques and materials for all that happened to the building and its history. The big loads due to the storage of tobacco bundles and the working machineries determined the need to replace the ancient wooden structures. So, for these racking loads needs, slab floors with diagonally positioned brick vaults where built, slab floors with metal beams and drilled bricks, brick-cement slab floors with prepared on site or precast secondary beams. After the 1980 earthquake, IPE beams were used for the consolidation of rooms with small vaults slab floors with light sometimes over 10,0 m.

The coverings are featured by Palladian style portal frames in chestnut wood and English style, iron portal frames, in both cases with a “Piemontese” warping. In the garret, precast lattice beams, set in a reinforced concrete curb realize an adequate bracing.

The new functions attribute to the building extremely different requirements from the ones determined by the manufacture activity. In fact, the racking loads are reduced, but new requirements are introduced for safety and emergency for the new crowding conditions, for the exploitation and well-being required by the new activities to settle.

3 The programming of rehabilitation interventions and maintenance of the technological system

Preservation of 1900 structures in pre-industrial buildings for the settling of new use destinations requires a new type of intervention planning on the built environment. To defend evidences of the past use variations, that are a bond for the built environment, it's necessary to realize the way transformed building complexes work, this can be done analyzing the conditions that determine the balance features. During the planning phase, to create a new type of balance it's necessary a framework acknowledgement to assure identity preservation and the satisfaction of use requirements for the new functions to be settled [2].

A "preferable" functional layout hypothesis of the new University site was defined (Fig. 1) evaluating compatibility of different distributive solutions as an option to the new functions.

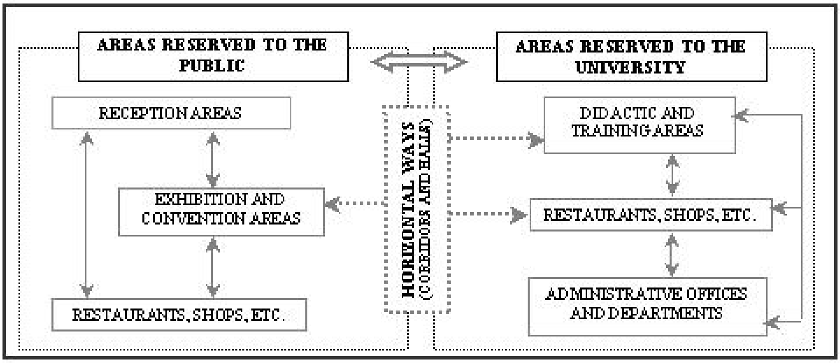


Figure 1: Hypothesis of the "preferable" layout for the Cultural and Touristic Pole.

Starting from this hypothesis, the performance level compliance was studied linking each area to the different requirements of the activities that there will be exploited. The control results are the base for the definition of the project's choices: in case of respondance between requirements and minimum levels required, the project's only aim, will be to plan maintenance activities in time to guarantee efficiency conditions in each environmental unit; instead, for units that require performance adequacy, the plan will fix interventions solutions based on the respect of the building's features (Fig. 2). So, the first problem is to define new ways to portray the built environment, to highlight the complex inner relation system, studying the morphological-building aspects in the actual obsolescence conditions. The informative system has to study the features that determine the building's identity, defining transformation bonds and highlighting connections between traditional building elements and the 1900 structures, through an evaluation of the effects of the interactions of these components [3].

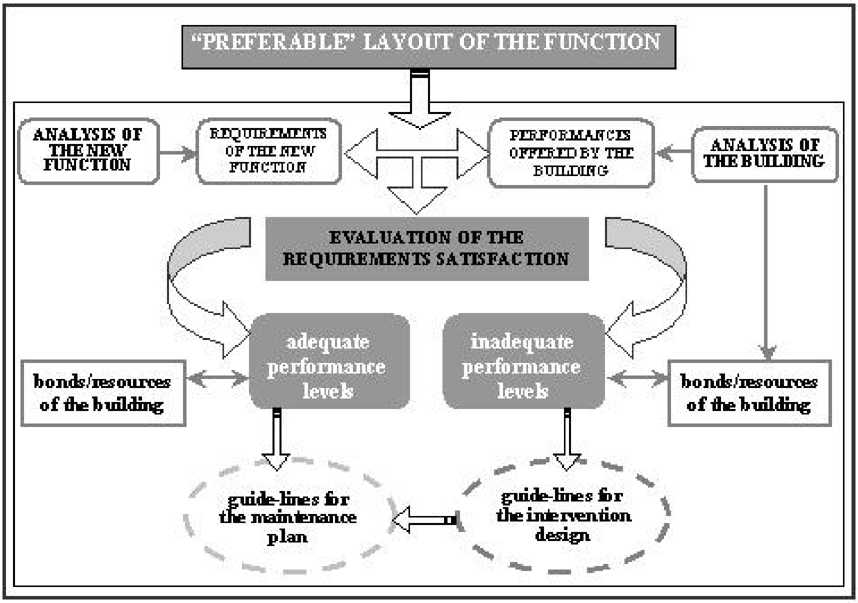


Figure 2: Design method for reuse and maintenance of the Tobacco manufacture.

The aim of the following tables is to build an informative system able to survey data featured by a progressive detail level. Beginning with a performance analysis of the environmental unit (Table 1), the proposed method estimates the efficiency of each technical element (Tables 2-3) and singles out the perceptive-cultural features (P: transparency; rhythm of the frames design; color and finishing of the frames), morphological–dimensional features (M-D: glazed/opaque surface rate; morphology with rectangular modules; section shape and dimension of the frames) and matter–building features (M-B: connection to the wall; frame and pane material; connection systems of the frames), considering them as transformation bonds. On the base of this evaluation, in case of inadequacy of performance levels, planning guidelines will be proposed; in case of adequacy of performance levels there will be only maintenance activities. The analysis of the requirement class "Management" is necessary when programming maintenance for the preservation of performance levels gained after the interventions [4].

4 Conclusion

The variety of factors that create the image of urban settlements and of their land context is composed, on one hand, by the built environment's features with the changes occurred in its life cycle, on the other hand, by the relationship between built environment and natural environment and the impacts.

Table 1: Analysis of the horizontal ways (corridors and halls).

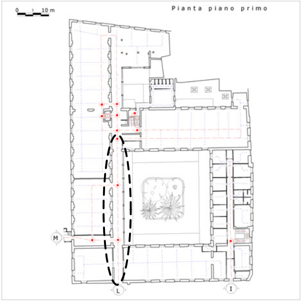
<table>
<tr><td colspan="3" rowspan="2"> 
Western façade and corridor on the first floor</td><td>LOCALIZATION: FIRST FLOOR</td></tr>
<tr><td>
</td></tr>
<tr><td colspan="3">FUNCTION</td><td>DIMENSION</td></tr>
<tr><td colspan="3">1) Horizontal connection</td><td rowspan="2">Width: 3,30 m
Length: 30,8 m
Height: 5,00 m</td></tr>
<tr><td colspan="3">2) Emergency ways</td></tr>
<tr><td>ELEMENTS OF THE CORRIDOR</td><td>DIMENSION</td><td>MATERIALS</td><td>CONSTRUCTION TECHNIQUES</td></tr>
<tr><td>1) Perimetrical wall (window-sill)</td><td>Thickness: 40 cm</td><td>Hollow bricks, ordinary mortar</td><td>Double-head hollow bricks masonry, with ordinary mortar and reinforced concrete pillars</td></tr>
<tr><td>2) Windows</td><td>Height: 380 cm
Length: 400 cm</td><td>Glass, mild steel</td><td>Window with frame connected with cramps to the wall, steel frame connected with riveted joints, blown rolled glass pane connected with stucco</td></tr>
<tr><td>3) Interior wall</td><td>Thickness: 100 cm</td><td>Bricks of yellow tufa, heap of stones, ordinary mortar</td><td>Dry masonry with faces of tufa bricks and ordinary mortar and packing of heap of stones</td></tr>
<tr><td>4) Doors</td><td>Width: 150 cm
Height: 240 cm</td><td>Chestnut-wood</td><td>Window with frame connected with cramps to the wall, steel frame connected with screws, sash connected with H and L hinge to the frame</td></tr>
<tr><td>5) Partition</td><td>Width: 3,30 m
Height: 5 m</td><td>Glass, mild steel</td><td>Window with frame connected with cramps to the wall, steel frame connected with screws, sash connected with H and L hinge to the frame, blown rolled glass pane connected with stucco</td></tr>
<tr><td>6) Floor</td><td>Thickness: 20 cm</td><td>Cement, steel, hollow bricks, ordinary mortar</td><td>Joisted mixed floor with hollow tiles supported by IPE steel girders, concrete floor slab and grès flooring</td></tr>
<tr><td>7) Ceiling</td><td>Thickness: 35 cm</td><td>Concrete, steel, hollow bricks, ordinary mortar, bituminous gaiter, panels of flexible foamed</td><td>Joisted mixed floor with hollow tiles supported by IPE steel girders, concrete floor slab, steam barrier, insulation, inclined and finishing slab and gaiter</td></tr>
</table>

Table 2: Analysis of the technical element: window.

TECHNICAL ELEMENT: WINDOW	FUNCTION	ROOM: CORRIDOR
	1) Lighting 2) Natural ventilation	

COMPONENTS	DIMENSION	MATERIALS	CONSTRUCTION TECHNIQUES
Frame	9,42x 40 mm	Mild steel	Welding of the steel sections and connection between frame and wall with steel cramps
Sash	40x20x5 mm (angle iron)	Mild steel	Connection between sash and frame the frame by riveted joints
Glass pane	75x55x0,5 cm	Glass	Connection between glass and sash with stucco

CLASSES OF NEEDS	CLASSES OF REQUIREMETS	REQUIREMENTS
a) Usability	Adaptability of the finishing and the mechanical components	a1 - Easiness of use and maneuver
		a2 - Shape-retaining
b) Safety	Steadiness	b1 - Mechanical steadiness with static loads
		b2 - Mechanical steadiness with dynamic loads
	Fire-safety	b3 - No toxic smoke emission
		b4 - Restriction of flame propagation
		b5 - Fire resistance
		b6 - Disposal of toxic gas
	Users' safety	b7 - Control of roughness
		b8 - Safety of use
		b9 - Control of intrusions
c) Comfort	Thermal and hygrometric requirements	c1 - Control of sun radiation
		c2 - Thermal-proofing
		c3 - Water-proofing
		c4 - Air-proofing
		c5 - Control of ventilation
	Visual requirements	c6 - Control of the light flow
	Acoustic requirements	c7 - Sound-proofing
d) Aspect	Aspect of the rooms	d1 - Inhygroscopicity
		d2 - Control of the surface condensing
	Aspect of the technical elements	d3 - Control of the finishing materials
		d4 - Lightness / heaviness
e) Management	Maintainability	e1 - Easiness of intervention
		e2 - Replaceability
		e3 - Repairability
		e4 - Cleanability
	Operation	e5 - Adjustability
		e6 - Reliability

Table 3: Performance evaluation and guidelines for the reuse design.

Req.	Characters	Evaluation		Guide-lines for the design
a1	MC-MD	The window can not be open	-	Integration with an opening system
a2	MD	The materials and the construction techniques guarantee the shape-retaining	√	Maintenance planning of the recovered window
b1	MC	The window stands only to its own weight	√	
b2	MC	The window stands to the wind	√	
b3	MC	The materials are not toxic	√	
b4	MC	The materials are not supporters of combustion	√	
b5	MC	The components do not lose their steadiness burning	√	
b6	P-MC-MD	The window can not be open	-	Integration with an opening system
b7	MC-MD	The finishing is smooth	√	Maintenance planning of the recovered window
b8	MC-MD	The window can not be open and the pane is fragile	-	Replacement of the panes with safety toughened glass panes
b9	MC-MD	The pane is not resistant to impacts	-	
c1	P-MC-MD	The window can not be dimmed	-	Integration with a dim system or replacement of the panes with protective cased glass panes
c2	MC-MD	The window is not adequately thermal-proof	-	Replacement of the panes with thermal-proof cased glass panes
c3	MC-MD	The connection with the wall and the joints of the panes allows the water intrusion	-	Integration with rubber packing in the connection with the wall and design of a glass stop system
c4	MC-MD	The window allows the air intrusion	-	Integration with rubber packing in the connection between the frames and with the wall
c5	P-MC-MD	The window can not be open	-	Integration with an opening system
c6	P-MC-MD	The window can not be dimmed	-	Integration with a dim system
c7	P-MC-MD	The panes and the joints do not guarantee the sound-proofing	-	Integration with rubber packing in the connection with the wall and replacement of the panes with sound-proofing cased glass panes
d1	P-MC-MD	The aspect, the shape, the dimension and the performances of the window do not change due to the water absorption	√	Maintenance planning of the recovered window
d2	MC-MD	The joints between frames and panes allows the surface condensing	-	Control of the insulation characteristics of the recovered window
d3	P-MC	The frames finishing requires frequent maintenance	√	Maintenance planning of the recovered window
d4	P-MC-MD	The big glazed surface and the small thickness of the frames make the window light	√	
e1	MC-MD	The window location does not allow the outdoor maintenance intervention without scaffoldings	-	Integration with an opening or removable frame system
e2	MC-MD	The glass panes and the frames can be replaced	√	Maintenance planning of the recovered window
e3	P	The panes can not be repaired	-	Replacement of the panes with cased glass panes
e4	MC-MD	The external surface of the window can not be clean without scaffoldings	-	Integration with an opening or removable frame system
e5	P-MC-MD	The window does not allow the regulation of air flow	-	Integration with an adjustable opening system
e6	MC	The window conserves its quality performance in the common use	√	Maintenance planning of the recovered window

The window needs an intervention (-); the window does not need an intervention (√).

The widespread practice that erases 1900 interventions on pre-industrial buildings or saves just single parts of the interventions as traces, does not guarantee building's preservation, when the identity is traced by the technologies layering that constitute the buildings' evolution [5]. So, planning criteria have to be defined to guide the intervention on the whole built heritage and instruments to support planning solutions for single cases interventions.

The 1900 interventions, in particular the ones for industrial architecture, can be recognized mostly through the adopted technological solutions that are the main feature, even if distinguished by a building "fragility" for a non sufficient know-how of materials and techniques. In pre-industrial buildings with strong XXth Century contributions, these elements have to be considered as a resource for they are evidence of the technological evolution and of the increase of the built environment's performances.

The project for the enhancement and re-use of these buildings will have to be supported by an attentive study of the built environment, to single out transformation bonds to respect its identity. In these cases, the use of compatibility check methodologies between built environment and new functions, guarantees that planning solutions will be able to keep the system balance that the building gained in time. So, the intervention's sustainability can be obtained with the use of built resources with the recovery of the building and, at the same time, with the settlement of activities aimed to the salvaging of the environment and to the promotion of an ecological-compatible kind of tourism. Sustainability can be intended in two ways: economics sustainability for the settling of driving functions in the building and, ideological-cultural sustainability for the use and the salvaging of natural and built resources already existing in the area.

References

[1] Pinto M.R., Il riuso edilizio: procedure, metodi ed esperienze, UTET, Torino, 2004.
[2] Caterina G, Il recupero degli infissi, UTET, Torino, 1995.
[3] Fiore V., De Medici S., Il sistema di regole, in: FIORE V., La manutenzione dell'immagine urbana, Maggioli, Rimini, 1998.
[4] Manfron V., Siviero E. (eds.), Manutenzione delle costruzioni. Progetto e gestione, UTET, Torino, 1998.
[5] Galliani G.V., Tecnologia del costruito, Alinea, Firenze, 2002.