

Railway building in Central Sicily: typology-building and construction analysis

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Abstract

Italian railway architecture, dated from the last decades of the XIX Century, is characterized by the opposition between conflicting realities, tradition and innovation, that is historicism and modernism. So, it is often at the centre of the architectural debate to find a connotative language for this typology. Railway architecture was born from an almost “independent” culture encoded by manuals and by the typologies chosen by the Government’s Central Technical Direction and it is common knowledge that the development of some layouts directed to strictly commercial matters and logics. The result of these policies shows itself when it comes to intervene on the buildings which were designed for local railway routes service (roadmen’s houses, signal boxes, warehouses, dormitories, etc.) and which are now no longer in use and more often at the center of public attention in relations to recent policies which propose their dismantling. From this perspective knowledge of the distinctive features (typological, morphological and building) of local railway building is a compulsory step to recovering and reutilization of this heritage. To recover these properties intervention guidelines are outlined starting from a technical analysis aimed to find the original features of the Central Sicily railway architecture.

Keywords: Recovery and renovation of existing building heritage, railway building, building heritage upgrading.

1. Introduction

Building recovery plays a leading role to identify existing resources and support their preservation, improvement and development, respecting both the cultural and environmental context and, moreover, building’s typological and constructive features. This paper focus on a wide building heritage that assumes the characteristic of a potential resource to be preserved. The refurbishment of this patrimony, distributed in the Sicilian inland, could be considered instead of further processes of urbanization and construction as a potential instrument for production and optimization of natural resources. It deals with a specific typology: disused and obsolete railway building heritage.

Studying railway architecture deals also with some questions due to the central administration of these projects. In fact this architecture was born from an almost “independent” culture, which manifested itself by means of a formal language, encoded by manuals and by the typologies chosen by the Government’s Central Technical Direction. These buildings are characterized by a complex contraposition having roots in the local environment and belonging at the same time to a technological grid. The construction of Italian railway lines has been a mean for the search and the

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manufacturers of railways as, for example, in English families Trewella and Sarauw, always engaged in the administration of sulfur mines. The Unification of Italy, undisputed engine in local implementation of the railway line had however its consequences on Sicilian industries, too related to the obsolete methods of production. Moreover in the central area, where was clear the determination to follow the mining paths, the stations were located in places away from population centers, leading to isolation of settlements and places on the heights. In consequence the same railway buildings were penalized in the opportunity to be part of a network relations, the artifacts were isolated in the countryside, only reached by mule tracks and not well served by infrastructure connections. So the gap between central railway line and other transport infrastructure still remains, exacerbated by the decline of sulfur. Actually this complex is waiting to be included in the European high-speed rail program or, as an alternative, in a reuse program. From this perspective it's very important to know the genesis and construction anatomy of these buildings: the first step to start a recovery program which aims to the refurbishment of the railway building heritage

2. Railway buildings in central Sicily

Facing with an epistemological approach towards these buildings entail the issue of design's centralization. This one become a focus in the research of archive source and references: local archive possesses mainly patrimonial documents in which are included some recall to typological construction imposed by Government's Central Technical Direction. So a typological analysis was lead through the study of tables designed by Royal Engineers Corp - Government's Central Technical Direction of Sicilian railways.

The study starts from these tables, dating 1882 and belonging to the Royal School Applications of the University of Palermo (documents not yet inventoried). The tables propose the building types for local model railway architecture and comparing these model to the construction realized end of the XIX Century in the center of Sicily is simple to individuate both typological and original features of this architecture. The documents are structured in order to pursue a strict hierarchy in which, starting from the simple artifact are showed the repeated technological elements and then introduced the design of more complex solutions.

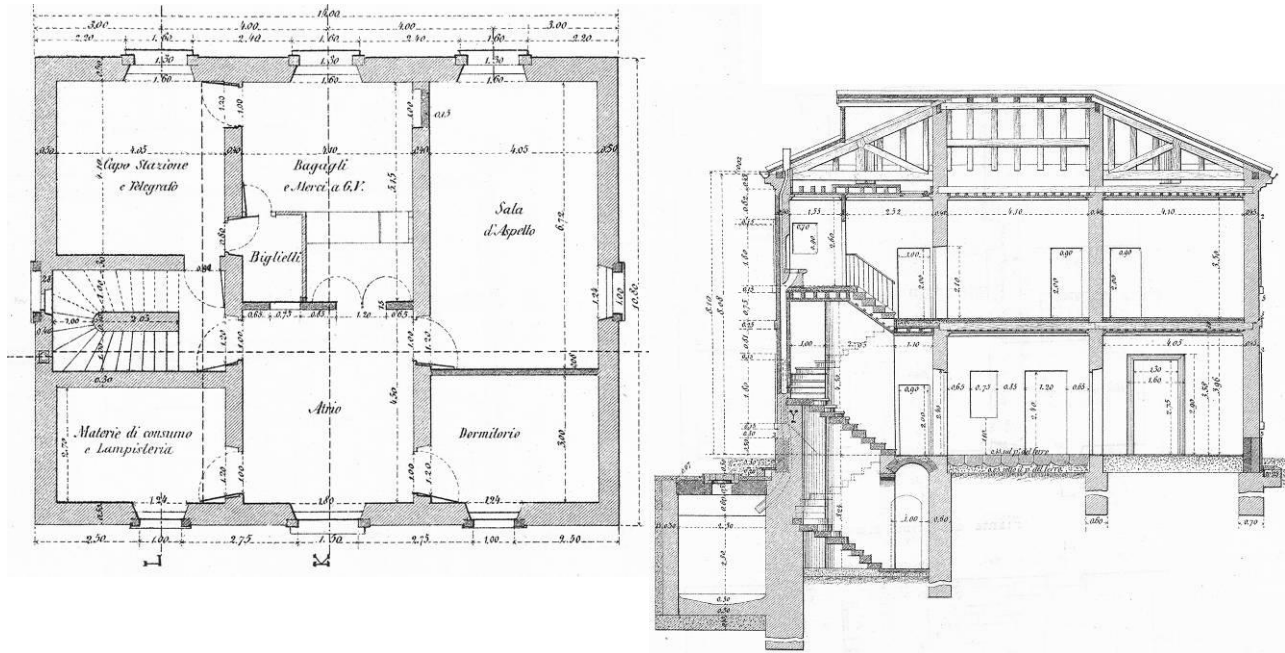
Studying both the old manuals and the tables, the organization of a railway complex emerges with the ensemble of buildings designed for specific functions (roadmen's houses, signal boxes, warehouses, dormitories, etc.) related to the relevance of railway yard. These macro-categories are declined by Central Technical Direction in specific typological building, characterizing both material and construction techniques. Each category is individuated by name and letter, specifically there are: station building – type A, B, C, D, E, warehouses – with external or internal track, locomotive depots – for two or four locomotive, roadmen's houses – simple one floor, simple two floors, double, and finally bartizan – simple or big. Also the support buildings are included in these tables, as warehouses, depots, wells, and so on. Many tables finally illustrate the finishing construction, such as windows and moldings.

To different typologies of artifact correspond different techniques, which result more or less economic in relation with the importance of the station. This sort of classification is clearly noticeable looking at the tables, that show through the basics categories which ones are the typological characters for the specific type. This fact emerges studying the station building tables, one of the most complete of this collection of documents. These buildings are all constituted by masonry whose thickness is between 40-50 cm (rustic), blocks are generally of sandstone (arenaria). The basics type was the so-called "type A", the stop (Fig. 2).

The stairs are made with stone-cutted steps stuck into the perimeter walls and the horizontal partitions are distributed putting vaults in the basements and attics plans for levels in elevation. The

floors are made in wooden beam while roofs present a typical solution based on wooden truss and Marseilles tiles. All the buildings are characterized by an inaccessible attic, isolating the pitched roofing creating space (over one meter).

The distribution functions of the plans reflects the usual setting for this type: on the ground floor there are the waiting room and the ticket office with a warehouse for baggage storage, the stationmaster's office and a separated warehouse for various materials, upstairs there are flats for the



stationmaster and other personnel. For “type A” the floor is made exclusively with wooden beams with false ceiling made of woven mats of reeds and plaster. The cellar floor is closed with

Figure 2. Type A: plan and section

barrel vaults made in three courses of bricks, which stood on the large thickness of the foundations, as to absorb the forces transmitted by the vaults also through the confinement action due to the ground. In the tables the foundation are represented in two different solutions (continuous or discontinuous foundations in masonry), the share discriminating value is always identified with respect to the “plane of iron” (about 3.20 m deep) continuous foundations in masonry and thicknesses are around 70 cm. The use of conglomerate is limited to the realization of the ground floors, for this category without crawl space. The upper floor has two accommodation characterized by the presence of typical fireplaces and sanitations in common. These ones are still separated from

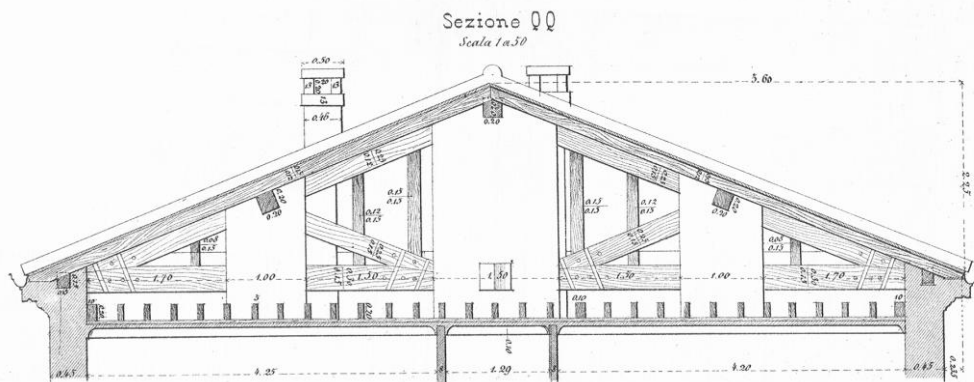
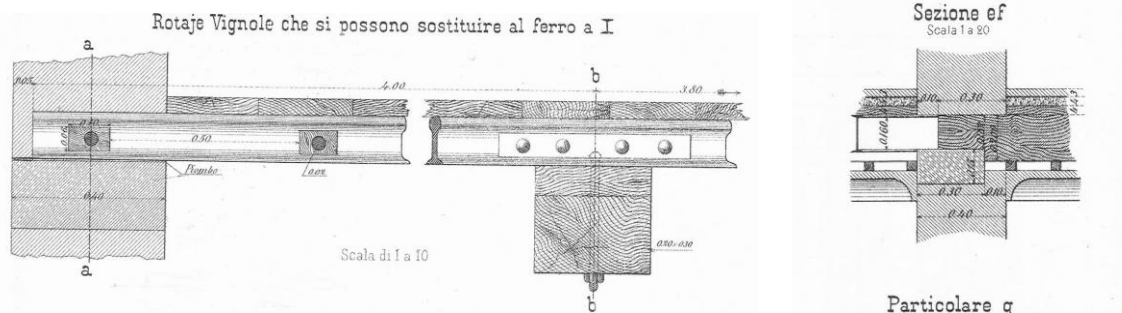


Figure 3. Cover section for type A

the services of the station for passengers, usually located in a separate building adjacent to the station building. The sections are represented as construction drawing designed to illustrate building systems and technologies. Some details often show the water sewage disposal and other elements (ladders, pipes, structural elements) for a complete interpretation of the whole building. The cover (Fig. 3), pitched roof with pavilion's heads, is settled on wooden trusses with feasible attic and is always characterized by a dormer overlooking the square outside.

The above-mentioned criteria of costs and materials optimizing generally requires the use of stone and wood, limiting the use of iron for brackets, bolts and wedges collaborating in the junctions of the trusses and construction of wooden beams coupled. This emerges studying the other types. The type C2 (second class), for instance, is also structured on a modular plan with five module. Each module is divided into two compartments: the atrium, which stands astride two modular units, acts as a distributor to other functional areas, behind this are at the local box office, and telegraph room, stationmaster office (this time the two offices are separated). On the sides are placed the premises for storage — respectively, baggage, high-speed wares, lamp room — and the stairwell near the two waiting rooms — separate first and second class and then the third. Isolated, next to the hall for travelers to the third class, is the dormitory, which can be accessed only from the outside of the building. The building present ten rooms on the ground floor and the same on the upper floor which has three accommodation. The building, in addition, had a lower ground floor, composed of a single large space that develops in the atrium. The differences between smaller and bigger type include both technological and material solutions. For the upper class stations (third and second class, corresponding to types B and C) are introduced some constructive variants: in these types wooden beams are always anchored to the wall in correspondence of the cantonal and in the middle through metal tie rod with anchor plate. For “B type” were individuated only descriptive tables of façade, floors and roofs, but these details already show how the structure results more complex than the basic type also in the use of materials in distribution structure. Economic issues gave rise to some



unusual construction systems as mixed floors of iron and wood (Fig. 4).

Figure 4. Mixed floors of iron and wood

These ones are proposed for the stations of the third and second class (types B, C1 and C2) and are characterized by alternating wooden and structural steel beams. Specifically the tables referred to profiles of “Ferrière Creusot and Dupont Dreyfus”, but it was not possible to verify if in place of the reinforcing “I” bars have been used vignole tracks, as customary for the railway buildings of that era (using “rotaje vignole” was specifically suggested by the Technical Departments of Sicilian Railway, as shown by the notations listed on the boards provided at the Royal Corp of Civil Engineers) [4]. This solution is suggested to cover spans over than 7 m, interrupted in the middle by a septum wall that serves as a section divider. The features proposed by Technical Government are confirmed out of the facts, in particular for distribution and functional aspects. This typological approach mainly characterize the minor complexes, as for most important center was imposed a customized design. This is one of the reason that lead the research into the middle of Sicily, an area full of railway building (both station and support construction) of lower classes: mostly built for

commercial transport. The comparison with the building involve specifically significant artifacts belonging to Enna's areas, such as Villarosa, Santa Caterina and Dittaino. All these complexes are dated between the last decades of Nineteenth Century and the early decades of Twentieth Century. The Enna's station (1875), back to the founding called Castrogiovanni, consists of a railway park that includes station building, warehouse, locomotives depot ad a roadmen's house. Unfortunately the station building refers to a type among those not yet identified, called in the documents "type E", presumably first-class station (Fig. 5).

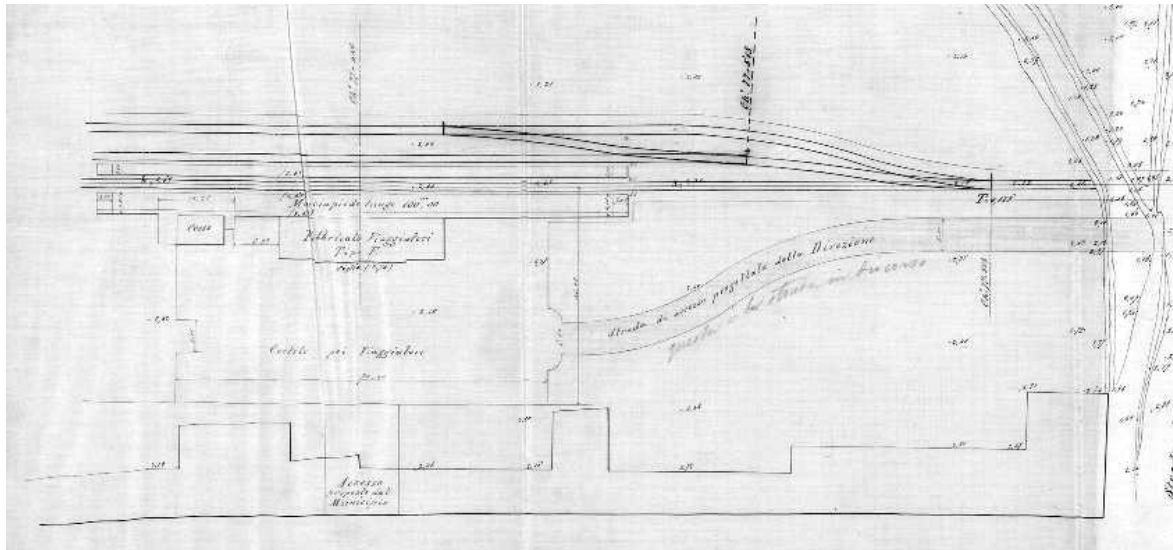


Figure 5. Enna's station: named "Type E" in a Nineteenth-Century document

Looking at station plan of 1908 is possible to investigate and reconstruct the evolution of the whole station of Enna and its station building [5]. The building is represented in its primitive form, a rectangular plan on two floors, without the characteristic forepart jutting on the square. This is the result of interventions of the 20s of the Twentieth Century: the forepart emphasizes the symmetric shape of the structure, but new enlargement works produced an extension along the tracks. The last intervention avoid the original symmetry with the construction of new buildings designed to host services for passengers (Fig. 5). Also from a constructive perspective material and techniques result

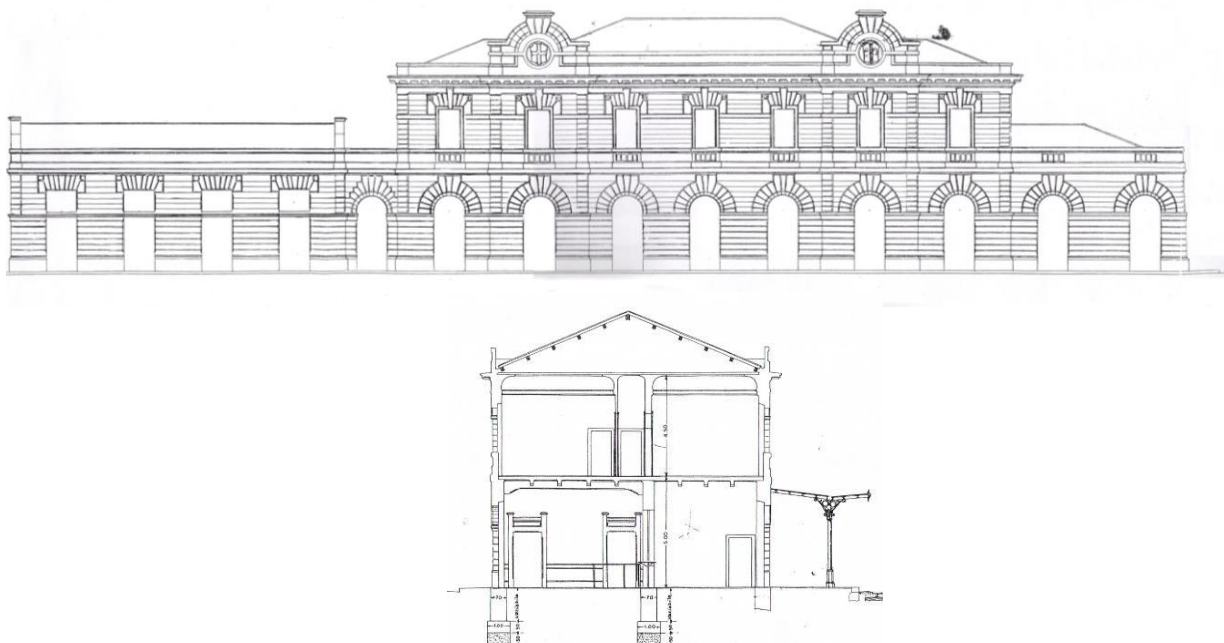


Figure 6. Enna's station in a 50s relief

different both from central government suggestions and former design of station of Enna. On the first floor are all in cast concrete beams with dovetail support. Mostly simple warping floors but the vestibule, in which there is a ribbed-slab rib decorated almost simulating a sort of coffered ceiling. Reliefs dating from around 1950 shows that the building was crowned by a wooden roof pitch below which there were false ceilings of woven mats of reeds and plaster. Actually in place of original floors there are I-beams and flooring blocks.

The point is that the station building represents the most significant structure of the railway park, so it results connected to a representative aim. From this perspective it's natural that during the years the station building could be involved in enlargement works, as the case of Enna's complex. Paradoxically the minor building, often abandoned, results well preserved from a typological point of view. Those buildings – as warehouse and locomotives depot – which are directly related to the size of the machine, present in consequence a more limited number of typologies (Fig. 7). In this case the design is based on strict modular criteria and results more limited. For instance the locomotives depot is structured along the longitudinal axis and is crowned by a particular wooden truss.

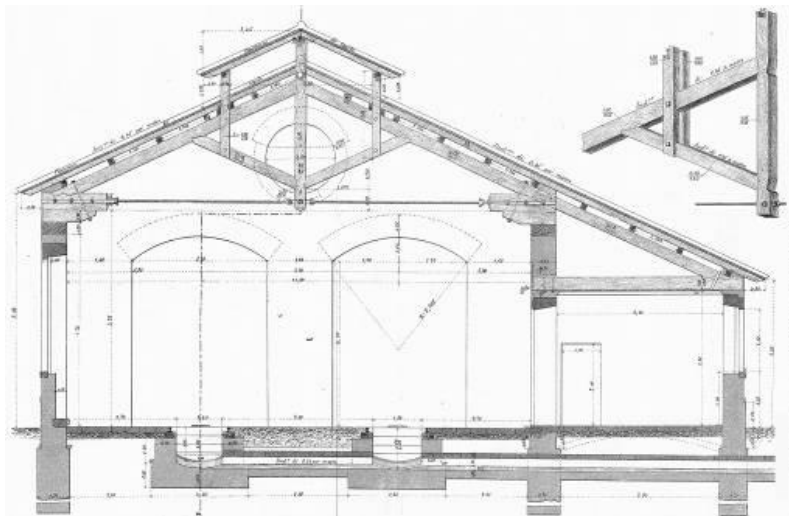


Figure 7. Locomotives depot: section

The nature of this element is due to the need of quickly disposing the fumes, so a truss's portion is raised to obtain a sort of open skylight. The locomotives depot category, for two or four locomotives, is also characterized by the "visiting pit" – a pit created with two piling partitions in which are placed the rails, located on wooden girder – that allowed the direct access of the electric engine and its maintenance. This type is very different from the northern models, often oriented towards a more complex geometry, such as circular or semicircular. In central Sicily the locomotives depots are designed on the Technical Government suggestions, some exception interests the ones realized in the latest period, early decades of the 1900. For instance the locomotive depots belonging to Enna's complex is crowned by a covering of iron truss, and also characterized by the use of concrete for the "visiting pit".

While in this case the morphology respects the ideal model, restraining the variants to materials, we can find some example in which the language encoded by manuals is totally avoided and contaminated by local culture or addressed to newest model. This is the case of the locomotive depot located in the railway park of Dittaino. The structure, a depot for two locomotives, presents

the typical mixed masonry and plan a but cover and finish results very different, adopting the local type of twentieth-century (Fig. 8).



Figure 8. Locomotives depots in central Sicily, Enna and Dittaino's case-study.

Also the class of the warehouses is tightly related to the dimensions of the wagons that had to approach the warehouse for loading and unloading services next to the opening (these ones abut indeed at a conveniently balanced distance, generally multiple of 8,5 m). The warehouse model presents two typologies: with external or internal railway line (Fig. 9).

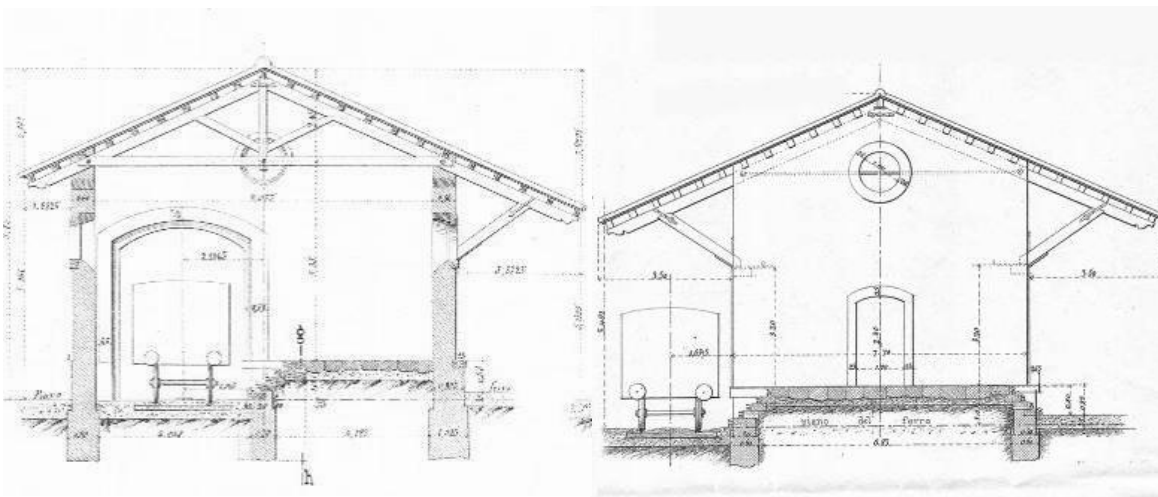
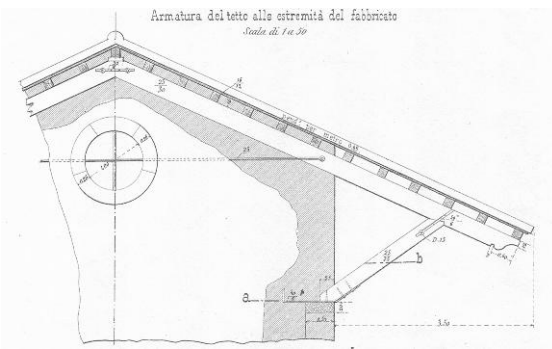


Figure 9. Warehouse type in Sicily: with external or internal line

The principal difference between the two type is the covering. In case of internal line the warehouse can accommodate directly inside the wagon and wooden truss, jutting out of the masonry perimeter to protect the store, becomes asymmetrical. Warehouses characterize the commercial stations of medium size, as Enna's one in which is built a warehouse with external railway line. The building presents a rectangular modular plan and the typical jutting cover specifically realized to facilitate the loading and unloading services. The planimetric structure reflects slavishly the manual's indications, but the constructive techniques show a few degree of freedom, probably the result of the local workers contamination. The lacks into the plaster allows to glimpse brickwork masonry, made of shapeless stones with mortar joints, sliver of stone and of bricks. The basement stands out from the foundations, as expected maintaining the continuity from loading platforms, and appears with squared ashlar deliberately visible in place of the usual plastered surface. A very particular solution results for the wooden trusses: in these ones the support



on the masonry isn't, as usual, made next to the node strut-truss, but directly on the rafter (Fig. 10).

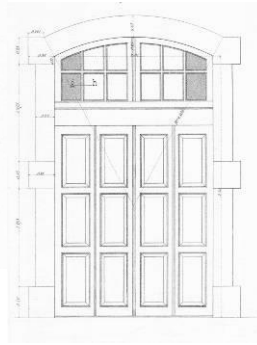


Figure 10. Warehouse: details and the Enna's case-study

The node instead jumps on the external perimeter of the masonry abutting on the strut that supports it. The artifact – completely abandoned at the present time – in the Thirties went through extension works that changed the planimetric structure alignment, achieving a prolongation in the parallel direction to the railway lines, designed for offices and for the classification of goods. Despite these works the original settlement is clearly readable. The shipment and receipt of goods was a focal point of the commercial stations, covering economic importance. The adoption of the models did

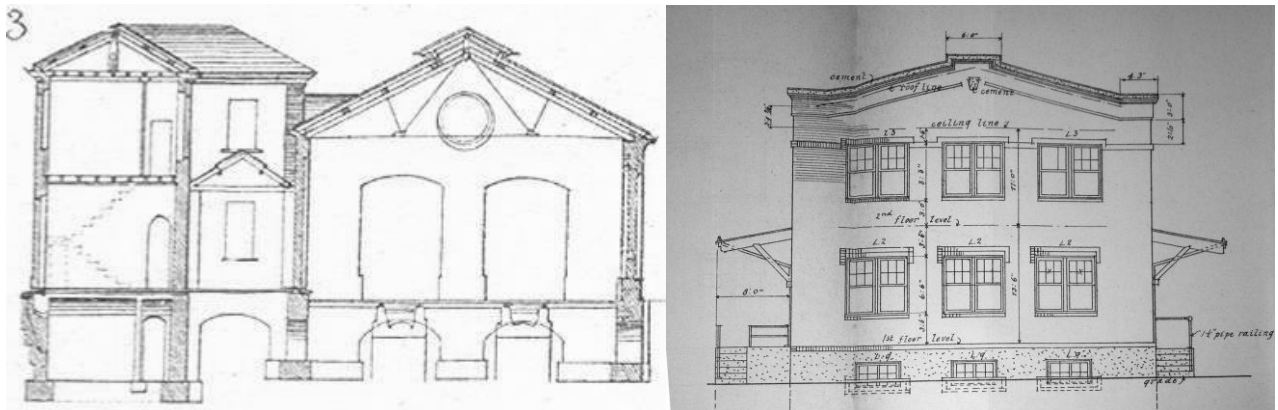


Figure 11. Two floor depot and warehouse of Nineteenth century in North Italy and America.

not relieve a all the designer from the knowledge and assessment of traffic, the means of loading, unloading and transhipment. These the same criteria are the basis of the standard models, consolidated in railway building culture at an international level. Also the warehouses of large American freight stations are based on these criteria and the different characteristics are due to the analysis of flows and traffic movements (fig.11), so far from the Sicilian ones.

The case study of roadmen's house is instead very articulate. While the construction techniques often reproduce the same solutions, there is a variety of building types. The houses are classified into five types: a simple plan, simple two floors, double, triple and double with oven. The base type (simple plan) consists of two adjacent compartments and an external compartment accessible from the outside, used for toilet. Each compartment is characterized by the typical masonry fireplace. The wooden roofs concealed by false ceiling of woven mats of reeds and plaster. The compartment intended to sanitation, of modest size, it presents juxtaposed to the structure. Inside the slab on the ground, without finishes, is realized with a sort of screed of gradients that allows disposal of sewage through the adjacent septic . The coverage is non-pushing type, the main beams (section 12x20 cm)

are joined at the wall plug, in the middle, with the typical carving slant made integral by metal bolts. On this stood the rafters (8x12 cm section) claiming the mantle of "tiles", generally Marseille type. The materials used for roadman' houses are essentially the same of minor station buildings, but there is more attention to issues related to the wealth and comfort (Fig. 12).

This peculiarity is due to the residential destination and emerges through the realization of ventilation systems. For instance in the simple two floors house the roof is characterized by "feritoje" (a sort of slits) practiced to air the attic. In central Sicily the most spread roadman's house type is the double one, as we can see from Villarosa and Enna's examples. The buildings show the perfect resumption of the typical distributive characters and of the materials that characterize the double house typology: the staircase placed in the central side divides symmetrically the building and the floorings of the low ground, tiles of cement grit, abut on a loose stone foundation. The principals difference noticed is at the plane floor, often made of iron truss and vaults (Fig. 13) .

Sideways, on the contiguous low body construction, are typically situated the workshops and the storehouse for materials. The simple two floors type presents instead a living area on the ground

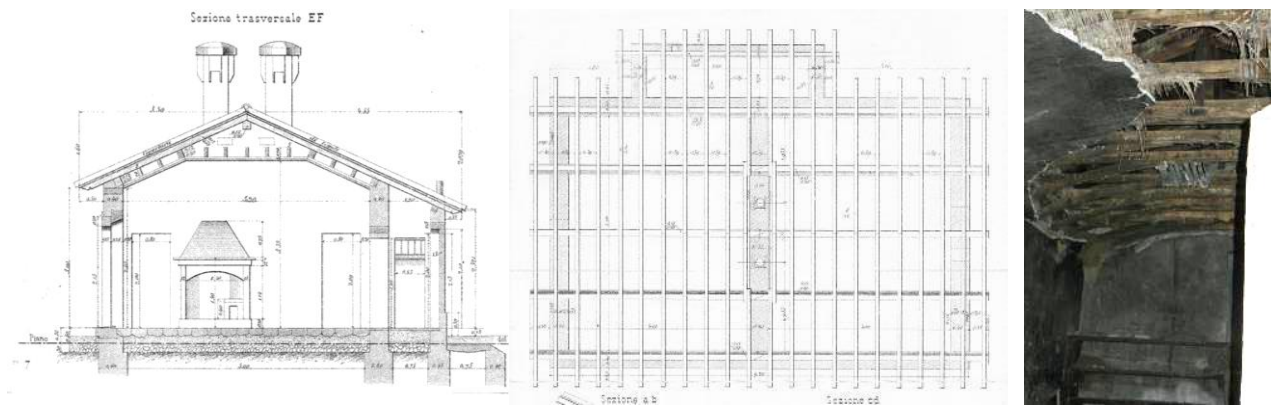


Figure 12. Roadman's house: simple plan type and details (roof, false ceiling)

floor and at the top, accessible through a L shaped staircase, the sleeping rooms. The stairs are settled on a flying buttress.

Another interesting category, not included in Technical Departments of Sicilian Railway's type, is the one related to residential building (Fig. 14). In fact new stations in central Sicily were rather

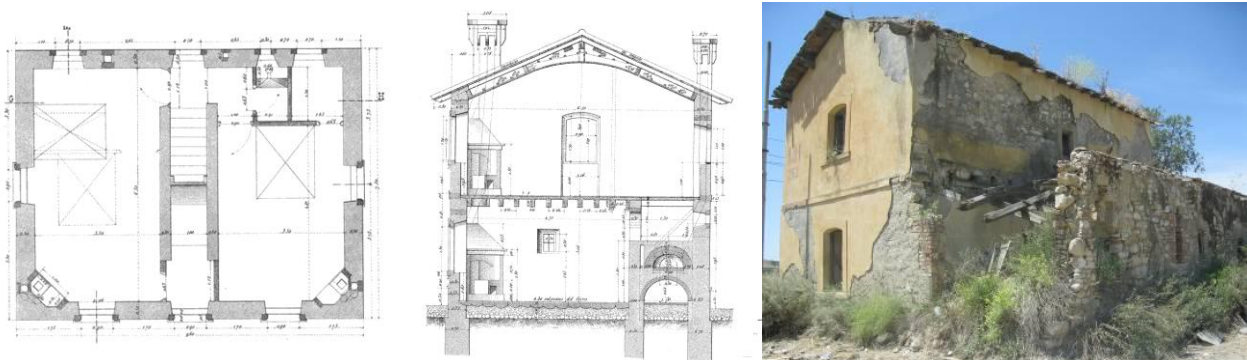


Figure 13. Roadman's house: double type model and case-study (Villarosa)

often built faraway from cities, for this reason dorms and lodgings rise up near the railway park. These buildings, datable in the early decades of Twentieth Century (so subsequent to the encoded typologies), present common characteristics both in techniques and materials. Also if not encoded in manuals this residential building are related to a typological approach, dealing with the

organization of railway-men welfare. The railway administration identified different categories for residential building, but the classification is lead to economical issue. In 1929 the administration of the State Railways had already made, "regardless of the housing built along the stations and along the lines of the network, for special categories of agents" [6] a number of accommodation of approximately 25,400 spread all over the country. The settlements, while complying with the same goals and design criteria, were divided into two categories - depending on the source of funds and



management standards: building built with capital funds and affordable housing residential railwaymen. A third case is eventually manufactured by the provider for the line. This data referred however only to buildings made after 1905.

Figure 14. Dorms in Villarosa and Santa Caterina stations(with stairs' detail)

Examining for instance Enna's station plans, placeable over a period of time stretching from the early decades if the 1900 to 1953, can be shown that, unlike the buildings made in the service of the rail track, the dorms arranged along the station road maintained their original planimetric set-up with the exception of negligible volumes made for plants. These buildings are all constituted by squared or cantonal ashlar as bearing masonry, made up with solid bricks whose thickness is around 60 cm. The blocks are of sandstone (arenaria), commonly used in Sicily and having good characteristics of thermal inertia for the Mediterranean climate, a coefficient of thermal wave phase shift of about 11h and an attenuation factor of 0,12. A thermograph has shown the masonry typology: mixed of stones roughly rough-hewn and edged with brick-bans. This solution is widely widespread in the railway buildings designed as dorms. In facts analogous situation can be noticed also in the near areas: Caltanissetta-Xirbi and Villarosa.[7] The difference is that the quality of the material gravestone in Enna's complex appears more regular and compact, as the perfectly horizontal courses shows. This fact is probably determined by the importance ascribed to the



Figure 15. Dorms in Enna and their brick-bans masonry showed in thermography

railway settlement, in this case a big node initially achieved just for commercial purpose and expanded subsequently. On the contrary the station of the near Villarosa presents more modest

dimensions and originates for the exclusive service of the surrounding sulphur deposit. The criterion to compare the quality and the expenses of the materials and of the adopted technical solutions with the “importance” of the node confirm the usual approach of railway building production, as the productive instructions of the governmental direction already testified. Dorms’ floor is made of iron and hollow tiles, but it was not possible so far to detect if in place of the reinforcing “I” bars have been used vignole tracks, as usual. In roof we can find a typical solution usually realized in third and second class buildings. Also in these buildings there are inaccessible attics isolating the pitched roofing. The dorm category land itself to some local contamination, as it was shown in case of Santa Caterina Station where the stairs are partially in concrete and partially with jointed elements.

3. Conclusions

Find existing resources and help their development and increase in value, in regard of the historical-environmental context and of their typological-building features is the only way for a cultural re-acquisition of abandoned artifacts. The lack of vitality that afflict Sicilian central railway line is indeed increasing the disuse caused by the natural obsolescence of these artifacts, to which was denied in the first place their primitive destination, as in the case of locomotives depots, and secondly, the opportunity to convert to a new destination because they are deprived of a real connection with the land and potential users. This study is setting the basis to identify these classes of buildings and their problems and to define the potential of these artifacts through guidelines for their recovery. So the identification of the types and classes and of technological elements that characterized it is here conducted in order to define the opportunities for refurbishment and adaptation, in terms of functionality and energy improvement. So the issues is not only “cultural”. The disciplines of restoration and design technology have not yet specifically faced the issue of energy efficiency in the protection of historic buildings. The theoretical point of the relationship between conservation and sustainability has not been thrashed out, despite the culture and practice of these two areas are really connected. From this point of view the reiterated techniques become an advantage in a process of refurbishment that could involve the whole railway buildings grid. Starting from the constructive abacus based on the standard models a real catalogue of possible intervention could be realized. The railway “grid” results in facts constituted by several artifacts with similar technological solution, but that could lend themselves to different new destinations (residential, tourist services), not only related with the original ones. The challenge is to re-create a bond between artifacts and context, users, territory. It’s a real trend, having roots in ancient famous cases, such as the Musée d’Orsay in Paris or the Plaza des Armas station in Sevilla which became a shopping center. This praxis has already arrived in Sicily, even though it involved only isolated cases located in the western area, such as Ficuzza Station and San Cipirrello Station, near Palermo (the county seat), which became respectively a restaurant and a wine sellar. This simple example gains in renewed value when contextualized in territories such as the Center of Sicily, which more than others is now paying the price of ambiguous economic policies with its artifacts and abandoned areas, which extend along a broad spatial and temporal front.

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