YILDIZ TECHNICAL UNIVERSITY - ICOMOS ICORP INTERNATIONAL SYMPOSIUM

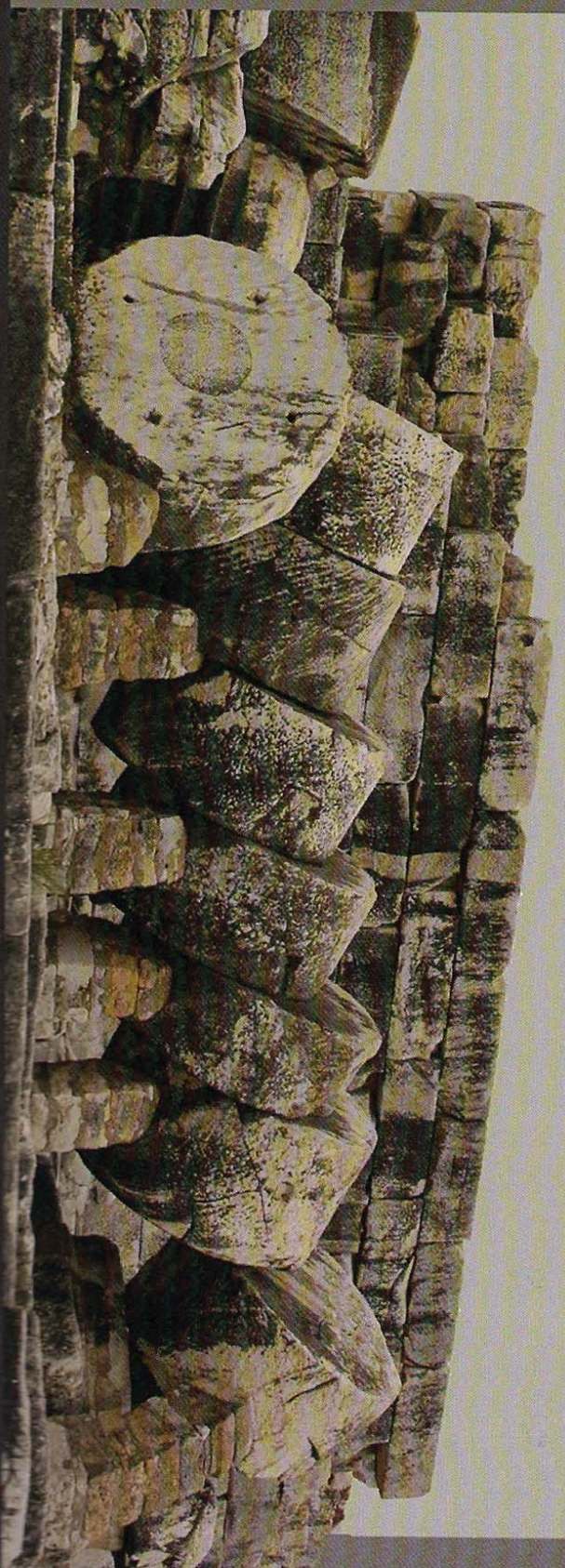
ICORP

HERITAGE & RISK

Cultural HERITAGE Protection in Times of RISK

Challenges and Opportunities

November 15-17 . 2012 Yıldız Technical University . Istanbul . Türkiye



PROCEEDINGS




T.C.
YILDIZ TECHNICAL UNIVERSITY PRESS

EDITORS

Banu ÇELEBİOĞLU Burcu Can ÇETİN, Ebru Harman ASLAN, Ebru Omay POLAT, Nilgün ERKAN
Nur UMAR, İrem GENÇER, Zeynep Gül ÜNAL, Uzay YERGÜN
(Alphabetic Order)

YILDIZ TECHNICAL UNIVERSITY – ICOMOS ICORP INTERNATIONAL CONFERENCE
Cultural Heritage Protection in Times of Risk: Challenges and Opportunities
Istanbul, Turkey, 15 – 17 November, 2012

ISBN: 978-975-461-490-9

YTU Directorate of Library and Documentation
YTÜ.MF.BK.2012-0859

Printed by Yıldız Technical University Printing-Publishing Center, Istanbul
Design, type and production by Organizing Committee
Cover layout by Banu ÇELEBİOĞLU, Zeynep Gül ÜNAL
(Cover Photograph: B. Çelebioğlu - Didim Apollon Temple, 2011)

According to Yıldız Technical University Administrative Board's ordinance taken at the meeting numbered 2012/20 and dated 11.10.2012 the book named "Cultural Heritage Protection in Times of Risk: Challenges and Opportunities" is printed on 250 units and the responsibilty concerning the content of the text belongs to the authors. The authors reserve the copyright for all the photographs and visual material used in the articles.

PROBLEMS OF PRESERVATION: CASE STUDY OF NINETEENTH-CENTURY BUILDINGS WITH PREFABRICATED METALLIC STRUCTURES IN COSTA RICA

1. Author: Cristini Valentina
Affiliation:UPV, Universitat Politècnica de València, Spain
Correspondance: ETSAV School of Architecture
E-mail: vacri@cpa.upv.es

2. Author: Ruiz Checa José Ramón
Affiliation: UPV, Universitat Politècnica de València, Spain
Correspondance: ETSAV School of Architecture
E-mail: joruiche@csa.upv.es

Summary

A detached feature of Costa Rican heritage is the group of prefabricated buildings, visible throughout the different central provinces of the country, built at the end of XIX Century, thanks to a Belgian Export Company/ "Herrerias de Aiseau". The prefabricated metallic structures travelled from Ambers-Belgium to Limon, the Costa Rican harbor on the Atlantic Coast.

The main feature of these constructions is their complex system of structures, typical of the European Metallic Revolution. Thanks to a precise assembly process, great examples of typologies were built in the middle of the country (above all public buildings, such as schools and churches). The authors have studied three of these buildings in particular, during their research training at TEC (Technological University of Costa Rica- San José- summer 2011).

The case studies are the *Church of Grecia*, the *Temple of Cartago* and the *Metallic School* Building of San José. The study has taken into account general architectonic analysis and survey but, above all, the authors have focused on the different pathologies (both material and structural) visible in the buildings linked to incorrect maintenance of the structures (like inadequate paint cycles, incompatible materials...) or risks associated with current uses and space transformation (layout extensions, improving of sanitary facilities, urban and district transformations...).

The aim of this study, is to explain the these buildings, their structural potentialities and the possible actual weaknesses and threats. For this reason, the analysis is above all focused on preservation strategies.

Key Words: metallic structure, historic public buildings, risk and conservation, XIX C. patrimony. Topic: Reducing risks from urbanization pressure

1. The reason behind the existence of metallic architecture in Costa Rica

Without any doubt metallic architecture built during the Liberal era is very widespread in Costa Rica. In order to understand it better, it's necessary to bear in mind the striking two-sided relationship between Belgium and the Central American country that was encouraged throughout the XIXth century. Less than thirty years after gaining independence in 1830, Belgium took the initiative to send a politician, Auguste T'Kint de Roodenbeke, as plenipotentiary minister, to present his credentials to President Juan Rafael Mora, (1858). Thanks to this act, on August 31st of the same year the "Agreement of Friendship, Trade and Navigation" was signed between the two countries (Hall C., 1985).

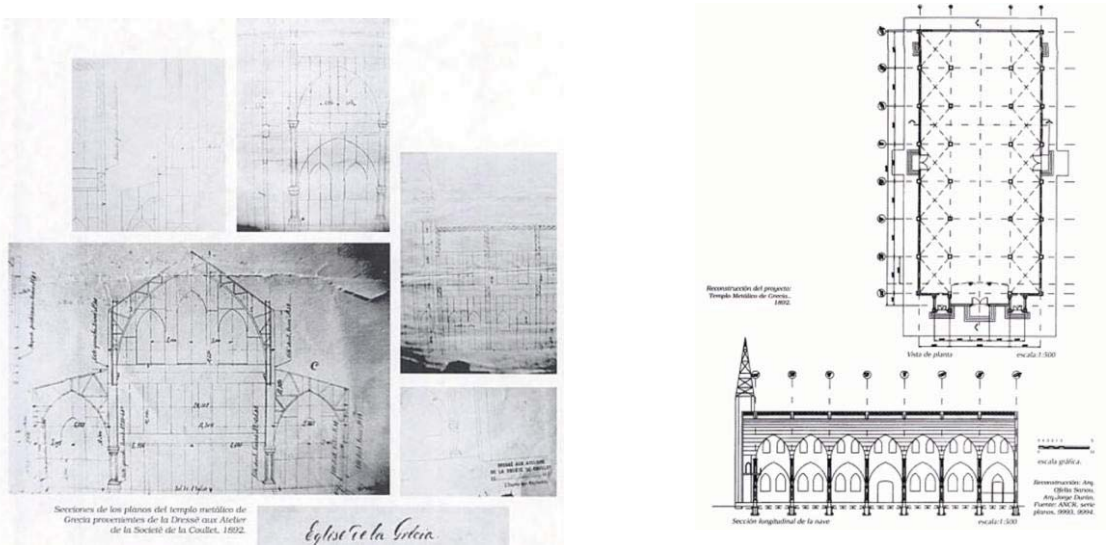


Fig.1 Details of metallic projects, *Merced* Church in Grecia (Sanou Alfaro M.O, 2001)

This agreement was a crucial and fruitful starting point for both political and cultural-economic exchanges. It's important to highlight that metallic architecture, the gem of Belgian industry, still marks both the city centre of San Jose, with its Metallic School, and the rest of the Central Valley, where it is possible to distinguish road and railway infrastructure, as well as the metallic church of Greece or Cartago (Sanou Alfaro M.O, 2001). In addition, several organs manufactured in Belguim adorn the churches of the Central Valley, among which the Cathedral of San Jose, boasting the biggest metallic organ in the country, stands out in particular (Altezor Fuentes, C. 1986).
The following research has been carried out by the authors during a stay at TEC, *Instituto Tecnologíco de S. Jose Costa Rica*, in the summer of 2010, thanks to a COOPEN scholarship (Colombia/ Costa Rica/Panama/European Network).

1. 1. The Liberal era and the eclectic movement

During the second half of the 19th century in particular, following the exhaustion of the stylistic resources of Neoclassicism, and under the influence of the Romantic trends of Costa Rican architecture, a constructive zeal which has nothing to do with traditional canons is witnessed, as a mosaic of hybrid trends of transition. It's possible to highlight different types of eclecticisms within Costa Rica: Neo-Gothic, Neo-Renaissance, and Neo-Romanesque among others. It is undoubtedly a "fin de siècle" stentorian panorama where, the so called

Victorian Style stands out in particular among a whole range of sub-trends, such as "Queen Anne", "Italianate", or "Stick" style (Ferrero L., 2004).

At this same time the industrial development of the Northern Hemisphere is echoed in the local construction activity in Costa Rica. For this reason all classes/types of serialized metallic constructive elements spread/extend throughout the country. Products such as metal frames, pillars, columns, frontons, balusters, pilasters, windows, doors and adornments of all types (cut or carved or turned by machinery) became common in architecture. In order to make the building of colossal dry-built metallic structures possible, the technology counts on metallic load structures and walls armed with metal sheets screwed together (Hall C.1985).

In order to understand this type of architecture it is fundamental to highlight out the link between the construction industry and the development of the railroad network in Costa Rica. Communication via railroad between Limon Harbor (on the Atlantic Ocean) and the city of San Jose started at the end of 1890; while Alajuela, San Jose and Cartago were linked by railroad in December, 1873. This modern system of infrastructures made the planning and the transport of the metallic parts possible, and without it the building of metallic constructions would have been impossible (Sanou Alfaro M.O, 2001).

2. Features of metallic architecture

Metallic architecture formed part of a series of town planning and architectural projects led by the new governing classes in Costa Rica, who had become rich thanks to the export of coffee throughout the 19th Century. The aesthetical criteria adopted for public real estates aspired to reflect the brand new technology and to represent a nation capable of sharing European constructive innovations (above all the advances in the galvanized iron industry). In this context it's not a surprise to see how metallic architecture is concentrated geographically in the coffee field areas or in the centre of the capital city, the richest and most advanced areas of the country (Blanc A., McEvoy M., Plank R., 1993).

In addition to representing the enthusiasm of the emerging bourgeoisie in Costa Rica for the constructive systems imported from Europe, this architecture also was a great field of experimentation to verify the response of the new material, steel, to earthquakes (Garnier J.E., Chakhtoura C., Mellom P.J., 1996). Aside from its lightness, ease of assembly and transport planning, the material displays excellent mechanical behavior, especially important in a country with such a high risk of seismic activity. In addition to the great elasticity and ductility of the material which enables the dissipation of large amounts of energy, it is important to add the advances in mathematical calculations during the 19th century that allowed the design of more ductile geometries and joints. These were in fact the first steps of prefabricated architecture in Central America. These early pioneers, trusting the ductility of the material and the design of these structures, shaped the first experiences of metallic structures in a highly seismic zone. For this reason a whole range of constructive details were conceived for this omnipresent metal, from riveted unions, small welds and overlaps, to interior or exterior coatings and fitted joints (Shelton Kirby R. (re-print) 1990).

2.1 *Bonaventura Corrales* Primary School, San José, Costa Rica

Bonaventura Corrales Primary School, in the center of San Jose, close to Mozarán Park, is popularly known as "The Metallic School". Designed by the architect Charles Thirion and

prefabricated by the "Societé des Forges of Aiseauen", of Belgium, the cost of its construction was very high, thus marking a milestone in the nation's educational and constructive revolution (Quesada Avendaño F., 2004). The most peculiar aspect of the construction lies in the fact that several segments of the building were numbered, pre-assembled and transported from Antwerp, Belgium to Port Limon (on the Atlantic Coast) in Costa Rica where they arrived in 1892, after a long constructive process which ended towards the end of 1896 (Crain E. 1994).

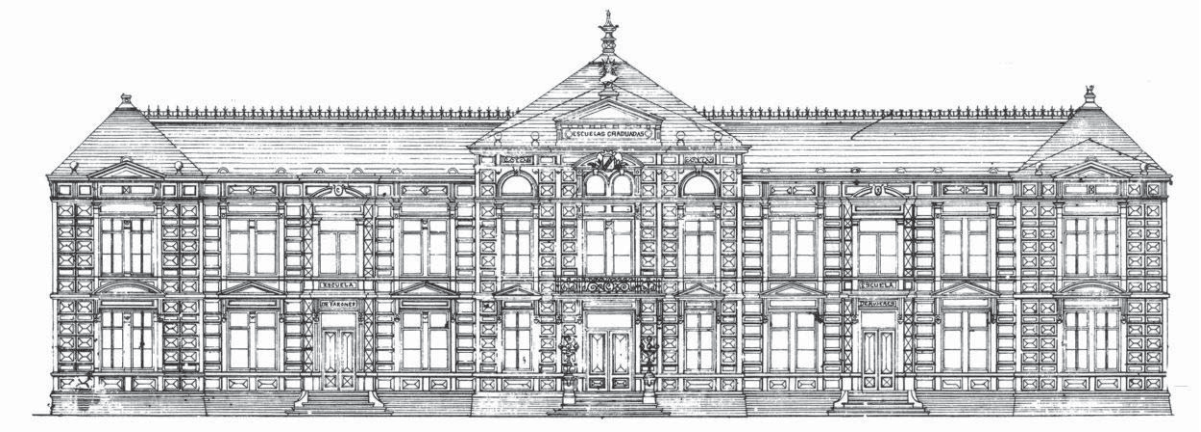


Fig.2 Metallic school, San José, original drawing of arch. Charles Thirion

The structure had a clear program: to house 800 mixed-sex primary school students in a didactic complex with the latest hygiene and sanitary standards and including elevators and innovative ventilation systems. The front of the building is adorned with a statue of Minerva, the Goddess of the Wisdom, on the main part of the 3 building complex. The central block, with its assembly hall, separates both student wings (one block for male pupils and the other for girls), thanks to a courtyard distribution structured with galleries with access to the classrooms.

The building, still used today as a school, was declared an example of Costa Rican architectural heritage in 1980, initiating in 2009 a long process of restoration, remodeling and adjustment of regulations (above all with regards to accessibility, services, facilities, etc.), sponsored by the Department of Education (MEP) and by others civil services (Url-2).

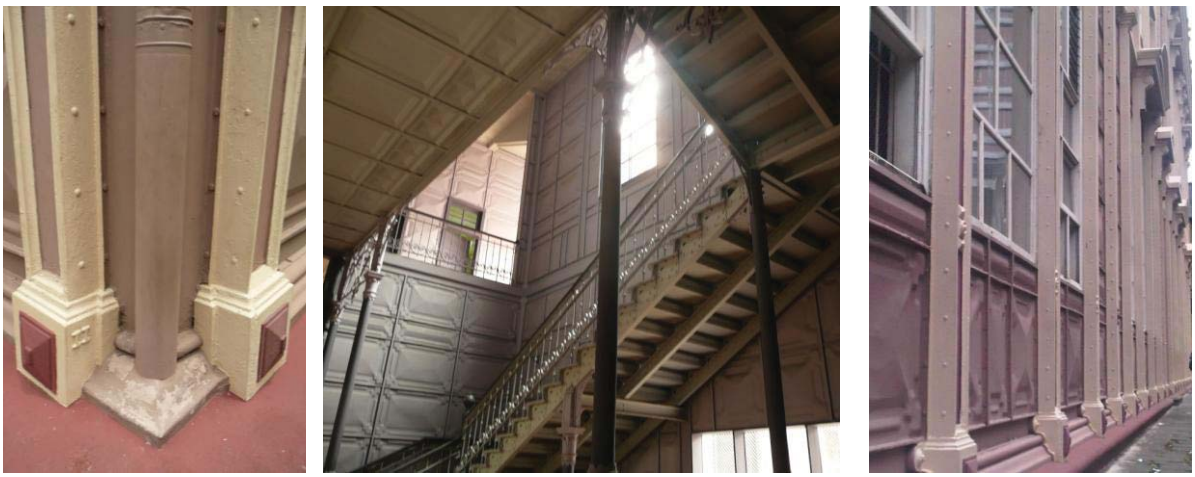


Fig.3. Details of metallic school, San José (Cristini-Ruiz)

2.2 *Merced* Church, Grecia, Costa Rica

This building, built in 1897, in the middle of the coffee district, possesses a long constructive history. In 1840, the city of Grecia already had an oratory, on to which a chapel was built in the same block where the current metallic temple is visible nowadays.
The original chapel had a wooden structure, with a roof of palm leaves replaced in 1853 by tiles (Sanou Alfaro M.O., 2001).

Like other zones in the interior province of the country, Grecia experienced rapid economic progress due to the export of coffee beans, as well as sugar cane and wheat. For all these reasons in 1867 the canton of Grecia was created, covering the current cantons of Valverde Vega, Alfaro Ruiz and San Carlos (Garnier J.E., Chakhtoura C., Mellom P.J., 1996).

Fig.4. Details of *Merced* Church, Grecia (Cristini-Ruiz)

For these reasons, and specifically in order to underline this new economical status of the region, in 1868 the civil and religious authorities decided to build a new church more in tune with both the technical advances of the epoch and with the new administrative services of the district.

The work began in 1868, albeit intermittently, as the masonry project had to be resigned in 1888 due to the consequences of a strong earthquake that paralyzed work on the temple. After this tragic event the advice of Mons Thiel, the second Bishop of Costa Rica, was followed, and in 1890 a temple of metallic structure, a safer more earthquake-proof structure, was built, following a contract with the company "*Aiseauen's Societé des Forges*" in the middle of 1891.

2.3 *Maria Auxiliadora* Chapel, Cartago, Costa Rica

The Maria Auxiliardora Chapel was intended for homeless children from the neighborhood known as "the Mill Block of the City", who were sheltered in the Orphans' Hospice of Cartago, managed by the Salesian Order from 1907 (Garnier J.E., Chakhtoura C., Mellom P.J., 1996). Once again in this project educational and technological values prevailed in the constructive program, with the aim of creating a foundation that would train and teach a trade

to helpless children (Sanou Alfaro M.O., 2001). The features of this building, modest and Neogothic in their influence, were realized *ex-novo* after the intense earthquake that devastated the city of Cartago and its surroundings in 1910 (Rankin M., 2012). In this case the reconstruction was made possible thanks to a mixed structure of wattle formwork walls and metallic sheets, and was only concluded in 1923.

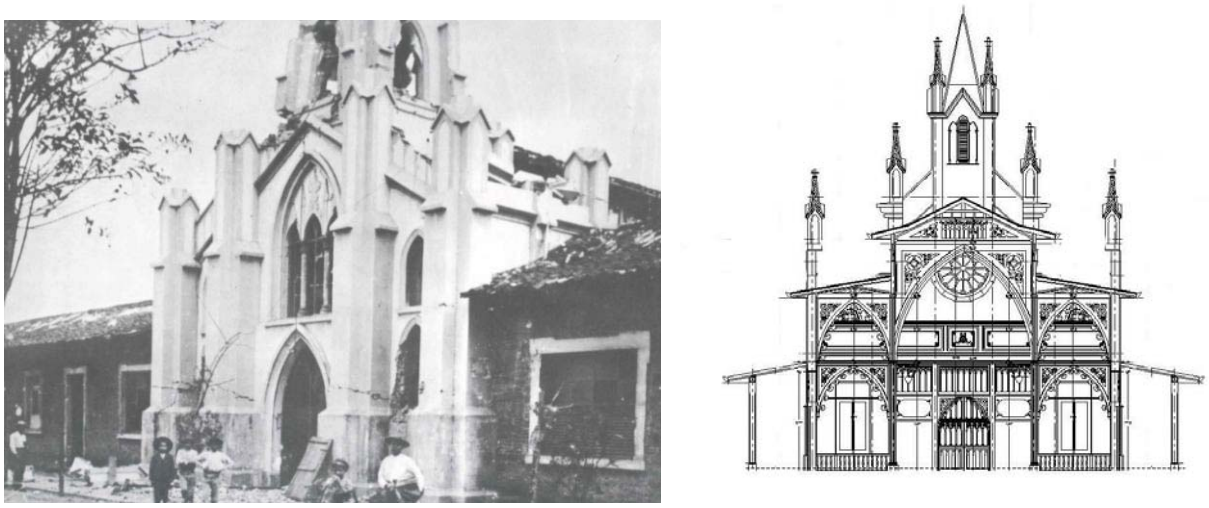


Fig.5. First masonry project of *Maria Auxiliadora* Chapel, later built with metallic structure (pictures from Url-1)

As is the case of the previously mentioned buildings, The *Maria Auxiliadora* Chapel was also recently the object of a conservation intervention in 2010. In addition to renovating the facilities and structure, the building has undergone an important chromatic change in all the façades, which have returned to original crimson color (Url-1).

Fig.6. Details of *Maria Auxiliadora* Chapel, Cartago (Cristini-Ruiz)

3. Detected pathologies and vulnerability of the restored buildings

The main problems detected in the studied buildings, in spite of their recent restorations, are due to corrosion in the most exposed layers of the metallic parts of the constructions. These problems can be explained by micro-cracks that are formed in the deep layers of paint, after years of maintenance and re-layering.

Fissures within the layers of paint, or small zones exposed to the constant dampness of the Costa Rican climate, become the starting point for oxidation in these metallic structures. Thus begins an irreversible process that progresses below the paint and gives rise to its peeling. In addition as time passes the compounds of the paint dissolve resulting in the detachment of the chromatic substratum and strata, and producing chipping in the top layers.

Fig.7. Details of layers of paint radically replaced, San José Metallic School and Cartago Chapel (Cristini-Ruiz)

For this reason, and as a way of improving the adherence of the paint, it has been common practice to leave the steel structure exposed outdoors for some time before painting it, in order to guarantee a good passivation layer on to which to the paint, with its resistant compounds, will adhere well.

The analyzed buildings, despite having been restored recently, do not display conserving actions; the layers of paint have been radically replaced, in many cases with the aim of creating an “in style” restoration of the buildings (Stubbs J.H., Makas E.G.2011). For this reason a nineteenth century image is undeniably evident in all the structural and composite restorations. Likewise, the demands of facilities and services take precedence over the restoration of historical surfaces, pavements, details or moldings, which in the majority of cases are realized ex-novo. Undoubtedly, the effort to conserve these particular examples of architecture is positive, but generally the interventions lack a global vision of Costa Rican metallic architecture; the projects are limited to isolated interventions, in many cases substituting obsolete parts with new alternatives. Moreover, in the majority of cases these replaced parts simulate the original constructive canons of the nineteenth century, without opting for a more evident legibility of the interventions**.**

REFERENCES

Garnier J.E., Chakhtoura C., Mellom P.J.1996. La Arquitectura metálica en Costa Rica: influencias belgas y europeas, EUNA, Editorial de la Universidad Nacional, San José.
Sanou Alfaro M.O. 2001. Arquitectura e historia en Costa Rica: templos parroquiales en el valle central, Gracias, San Ramón y Palmares (1899-1914), Universidad de Costa Rica Ed., San José, Ed.p.231-244
Altezor Fuentes, C. 1986. Arquitectura urbana en Costa Rica: exploración histórica 1900-1950, Editorial Tecnológica de Costa Rica, San José
Quesada Avendaño F. 2004. En el Barrio Amión, Editorial de la Universidad de Costa Rica Ed.
Ferrero L. 2004.Sociedad y arte en la Costa Rica del S. XX. Euned Ed., San José
Stubbs J.H., Makas E.G.2011. Architectural Conservation in Europe and Americas, Wiley& Sons Ed. New Jersey, p.568
Harris M.C. 1977. Illustrated dictionary of Historic architecture, Mc Graw Hill, New York.
Crain E. 1994. Historic Architecture of the Carribean Islands, University Press of Florida Ed., Miami, USA.
Rankin M .2012**.** The History of Costa Rica AC-CLIO Ed., Santa Monica, USA
Hall C.1985. Costa Rica, a geographical interpretation in historical perspective, Westview Press Ed., USA
Collins P.1965. Changing ideas in modern architecture, Mc Gill Ed., Quebec, Canada
Giedion S.1941. Space, time and architecture: the growth of a new architecture, Harvard University Press, Cambridge, USA (Chapter "from metallic column to steel structure").
Blanc A, McEvoy M., Plank R. 1993. Architecture and construction in steel, Spon Ed., London, UK
Shelton Kirby R. (re-print) 1990. Engineering in History, Dover Ed- Mc GrawHill, NewYork, cap.14

Web sources:
Url-1., http://www.google.es/search?q=ww.mcj.go.cr%2F...retrieved on June 2012
Url-2., www.cfia.or.cr/digital_flash/241/descargas/tra_equipo.pdf retrieved on June 2012