

Contemporary problems of Architecture and Construction

Proceedings of 7th International Conference
Contemporary Problems of Architecture and Construction
Florence - Italy



La Scuola di Firenze editrice



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*presentare gli altri lavori
 con logo?*

GREETINGS BY THE UNIVERSITY OF FLORENCE and DiDA

Saverio Mecca
 Director of the Department of Architecture
 University of Florence, Italy

I am honoured to present in Florence this book that collects contributions for multiple experiences of international research on the topic of Contemporary problems of Architecture and Construction, particularly complex and articulated. The management of the contemporary aspects and problems of historical heritage, the preservation of cultural memory, are necessary activities that concern and cut across a variety of different disciplines, whose complexities are evident as long as they require a specific definition of the identity of the architecture.

7th International Conference
 Contemporary Problems of Architecture and Construction
 Florence, 2015

The Department of Architecture DiDA is a structure of the University of Florence dedicated to scientific research, educational and formative activities, transfer of knowledge, innovations of the activities addressed to architecture, industrial design, territorial and landscape planning.

The Department of Architecture promotes the internationalization of the research activities, of the valorisation and transfer activities, of the scientific and technological advice, even in cooperation with other academic and research structures, both public and private, as it is underlined in the book that we are presenting.

The DiDA, looking forward to these aims, organized an internal system of laboratories by instituting the DiDALABS. The mission of the DiDALABS is to support, both scientifically and technically, the education, the research and the higher formation, the transfer of knowledge of the DiDA and of the Athenaeum in the areas of architecture, industrial design and landscape and territorial planning area.

Above all, the Survey of the Architecture Laboratory LRA is our structure predisposed to the formation and research above the Architectural and Archaeological Heritage.

It produces surveys of the architectural, the urban and landscape complex integrating the competences that are now being employed in the sectors of documentation and preservation of the Heritage.

These activities may also support the public and private institutions operating in the sector of Cultural Heritage.

The knowledge transfer represents the fundamental element, which can valorize or potentiate the formative offer through the conducted scientific experiences.

In addition, these experiences permit to tune the operative methodologies for the digital survey, giving essential instruments in order to understand and evaluate the preservation and restoration interventions.

The activities developed by the laboratory include several examples of case studies relating to UNESCO sites, investigated with the architectural survey and the Science of Representation, explicating in these pages the technological development that has focused on the representation of architecture during the recent years outlining paths of inquiry through which to define methodologies and operational protocols for the understanding of the historical and monumental complex.

The research presented often involve students, graduate students or PhD students, increasing the value of the experience with that of advanced training and education in a sector in which knowledge can be developed only staying in contact with the architectural and engineering contemporary problems.

I believe that the occasion of this International Conference, which presents a full program of roundtables and meetings, represents an important opportunity for dialogue and scientific exchange on the subject, being able to offer excellent points of reflection for teachers, professionals and students under an international point of view to the historical heritage.

Know in depth a building, especially when its historical and cultural value is strongly established, as in some cases that will be presented here in this volume, is the basis for the preparation of a conservation project that will necessarily be caught and not just aimed at the preservation but aiming too its transformation so that it can be revived and returned to the community.

I believe that all phases of the survey and analysis of a monumental property without hesitation could be define purely an "architectural project".

Finally, our warm thank you to the organizers and members of the research groups that have helped to enrich their experiences and reflections with the issues of the Conference.

Stefano Bertocci, Paola Puma

The scientific referees for University of Florence, Department of Architecture-DiDA

A short history of the International Conference on Contemporary Problems of Architecture and Construction

To present the 2015 edition, we should like to premise a short history of the conference: in 2008 and 2010 Yerevan State University of Architecture and Construction has organized the first and the second International Conference entitled "Architecture and Construction - Actual Problems".

The conference was held in Jermuk, Armenia. The third year was organized in collaboration with the Beijing University of Civil Engineering and Construction from October 20th to 24th, 2011, and was entitled "International Conference on Contemporary Problems in Architecture and Construction" and this title is used up to the present day.

The fourth conference was held in Czestochowa (Poland) from September 24th to 27th, 2012, as a joint effort of the Yerevan State University of Architecture, the Beijing University of Civil Engineering and Construction and the Czestochowa University of Technology.

The fifth conference was organized by the Saint Petersburg University of Architecture and Construction from June 25th to 28th, 2013, as a joint effort of the Yerevan State University of Architecture, the Beijing University of Civil Engineering and Construction, the Czestochowa University of Technology and Saint Petersburg University of Architecture and Construction.

The sixth conference edition was organized by the VŠB - Technical University of Ostrava (Czech Republic) from June 24th to 27th, 2014, jointly with the Yerevan State University of Architecture, the Beijing University of Civil Engineering and Construction, the Czestochowa University of Technology and Saint Petersburg University of Architecture and Construction.

The 7th International Conference on Contemporary Problems of Architecture and Construction

The "7th International Conference on Contemporary Problems of Architecture and Construction" we are proud to guest in Florence, is held in 2015 at University of Florence, organized by the Department of Architecture-DiDA on 19th -21th November, 2015, with the collaboration of the others universities and entities involved in the partnership.

The 7th Conference is promoted by six different universities, all represented by some of their members in the Scientific Committee:

- University of Florence, Italy
- National University of Architecture and Construction of Armenia, Armenia
- Beijing University of Civil Engineering and Architecture, China
- University of Technology Czestochowa, Poland
- St. Petersburg State University of Architecture and Civil Engineering, Russia
- VSB - Technical University of Ostrava, Czech Republic.

The Fondazione Romualdo Del Bianco with its International Institute Life Beyond Tourism, who has been essential in facilitating at early stage the contact between University Florence and the other Promoters, has had an essential role in to the dissemination of the conference throughout its international network of universities and the organizing managing.

This edition of the conference is an interdisciplinary symposium dedicated to the architectural and urban works -from the 2nd half of 20th century- and to urbanism with a special focusing on topics of "cultural heritage's culture".

The intention of the organizers is, in fact, continuing the discussion on the relationship between the society and the technical and cultural meanings of architecture and urbanism. Also representatives of other fields than architecture have had the opportunity to submit contributions and open the space for the discussion of other problems.

The purpose of the conference is to find and evaluate in the open discussion the current state of knowledge of architecture (see at topic 1. Civil Engineering, reconstruction, sustainable construction, materials and technologies and topic 2. Architecture and Design, urban planning, urbanism) not only from the perspective of different scientific fields but from the experience from various countries with their different developments and approaches (see at topic 3. Environmental engineering, energy, green buildings).

Besides the technical and infrastructural dimensions of the construction (see at topic 4. Geotechnics, seismicity hazard analysis and prevention and topic 5. Construction, structural mechanics, transport problems), we focused on one of the largest fields of specialization of the Italian competence: the culture of heritage (see at topic 6. Technologies and operational methodologies for conservation and topic 7. The fruition of the heritage: cultural value-based travel, routes and landscape. New uses and enhancement of monuments).

The issue is addressed from many points of view: from the methodologies of documentation and survey to the protection theory and practice.

Finally, the highlights of the Florentine edition: the most recent new lines of research regarding the fruition of heritage and its enhancement in its many different meanings.



TABLE OF CONTENTS

Board of the universities and partner

Committees

Greetings by University of Florence and DiDA

Greetings by Fondazione Romualdo Del Bianco-Life beyond tourism

SESSION 1

Civil Engineering, reconstruction, sustainable construction, materials and technologies

Application of the hydrodynamic leveling method in erection work

Barkhudaryan A., Barkhudaryan M.3

The use of fuzzy inference systems to provide more intelligent hospital management system

Basiri A., Basiri A., Amirian P.9

Numerical studies for retrofitting of concrete coupling beams with stiffened laterally restrained steel plate

Cheng B., Shi C., ChengZhi Q.13

Calculation of thin-walled prefabricated type shells with model of plastic-rigid body

Churchelauri Z., Kipiani G.19

Structure style selection of the mid-tower of a three-tower suspension bridge

Dong J., Feng J., Liang T.25

Study of low-carbon and low-alloy steel recrystallization with the use of passive flux-gate test method

Gordienko V., Smirnova E.31

Evaluation of technology applying limestone powder in road pavement layers

Gyulzadyan H., Ter-Simonyan V., Voskanyan G.35

Analysis of the influence of reactive powders on the chosen high-value concrete prices

Halbiniak J.39

Application of green construction technologies in XX Project

He Z., Dong J.43

Some features for strengthening of masonry buildings in seismic regions

Karapetyan L.47

Experience with the use of risk analysis methods for working forensic expert and an alternative method of determining the value of the coefficients

Kubečka K.53

Load-carrying capacity of timber structure bolt connection subjected to double unequal shears with thick plates as outer members Kubečka K., Musílek J.	59
Biodegradation of composite systems applied on the cladding of panel buildigs Kubečková D.	63
Discussion on segregation and bleeding problems and the stability model of fresh concrete Li C., Zhang F., Wang H., Zhang Z.	67
Experimental study on compatibility of stone powder and superplasticizer in concrete Li C., Zhang F., Wang H., Zhang Z.	73
Application of hyperelastic murnaghan material to the calculation of steel structures using adina software Major M., Major I.	77
Climate change and water resource management of nagorno-karabakh Manukyan A.	81
Calculating method of load-carrying capacity for recycled concrete squat walls failed in mixed flexure-diagonal compression Peng Y., Wu H., Guo J.	87
Reuse of industrial areas conversion of the metallurgical tower to a restaurant with panoramic views Perinkova M. Kolarcikova L., Tvrda M.	91
New laser range finder for the high-precision linear measurements Petrosyan H., Hayrapetyan Y.	95
Strategic planning: infrastructure development of Saint Petersburg based on dynamic model Petrov A., Tokunova G.	99
Contemporary buildings of filial catholic churches in Poland Repelewicz A.	103
Challenges in coastal and island design, construction and development Saldana C.	109
Several issues on protection of underground sections of buildings and structures against moisture and waterlogging with groundwaters Sargsyan V., Khachatryan E., Khachatryan A.	113
Interpretations of wash out process of earth dam body Sarukhanyan A., Kelejian H.	119
Creation and work with architectural and construction terms glossary Seifullin S., Zhamankulov A.	125
The influence of covering of industrial concrete floors with selected chemical agents on the improving of their performance parameters Selejdak J., Szopa R., Urbański M.	129

The comparative analysis of different calculation methods of the long cantilever plate of beam bridge Si X., Dong J.	133
Temperature-moisture problems of embadded wooden ceiling Šubrt R., Bednářová P.	139
A numerical method for computing the thermal conductivity and thermal diffusivity of the building materials Tang M., Ren J., BaiY., Dong J.	145
Complex projects management in design activities for architectural and engineering companies Tebeyev K., Tatygulov A., Zhumanov K., Zhamankulov M.	151
The study of crack propagation attached to the base of the hard section structure having double-connective boundary line Ter-Petrosyan G.	157
Analysis of influencing factors affecting cable tension test based on frequency method Tian C., Dong J., Meng Y.	163
Construction brand on the Polish market Urbańska J.	169
Parameter sensitivity investigation of the large-span main beam section Wang X., Dong J.	173
The application of circular arc failure nomogram in the rock slope stability analysis Wei C., Liu F., Dong J.	179
Civil and structural engineering in adverse climatic conditions using the example of projects for Astana and Atyrau Yestayeva A., Vyacheslav. Shepel, Zhanabek. Zhumatayev.	183
System of tenement buildings in the architecture of European and Far East Russia cities of the early twentieth century Yudenok I.	187
Study on testing indexes of concrete durability Zhang X., Zhao D., Zhao S.	191
Review of research on prefabricated steel structure residential building industrialization Zhao D., Fei S.	197
Review of research on the fatigue of high strength concrete after high temperature Zhao D., Gao H.	201

SESSION 2

Architecture and Design, urban planning, urbanism

Theoretical aspects of the formation and development of the identity of urban public spaces. By the example of the largest cities in France Akhtiamova R., Akhtiamov I.	207
--	-----

Preconditions for large city planning structure development process management today Aloyan A.	213
The ruins of the Canonica dei Decimari at Magliano in Toscana Aterini B., Nocentini A.	217
Transformation of high valued urban territories in the Yerevan development process Avetisyan A.	223
The role and peculiarities of composition in the formation of wayside service objects and complexes Barseghyan N.	227
Architecture programmes, the issues of women and water as hazard and water as heritage in the first half of the 20th century Bostenaru Dan M.	231
The transformation of kindergartens Frolíková Palánová K., Šafářová V.	235
Vulnerable houses in the southeast of Mexico Galiote M., Alberto Escobar J., Cecilio V., Morillón D.	239
Analysis of urban residential environment of the far north of Russia and methods of its development on the example of the city of Ukhta Garshtya A.	243
Smart design for smart city. Link as a plan strategy from architecture to landscape Gasparini C.	249
The features of forming eco districts' large-panel buildings in Yerevan Ghushchyan L.	255
Techniques of modern interpretation of ethno-cultural motives in environmental design Gorgorova Y., Kozlov V.	261
Architect David Chislyan's contribution in the redevelopment of Armenia Hakobyan S.	267
Issues of modernization of school buildings of the Republic of Armenia Harutyunyan E.	273
Project of enhancement of natural and historical-cultural resources in Chinandega and León departments (Nicaragua), through a project of community based tourism Invernizzi E.	279
Mosaic from the public bath of Armenian ancient capital Artashat and restoration of its original image Kanetsyan A.	283
The significance and theoretical aspects of classical monuments' 3d-reconstructions for contemporary classical architecture Karelin D.	289

Architectural-planing particularities of open spaces in consideration of Yerevan city historical development Kartashyan T.	293
Architecture, too slow in developing? Meyers A.	297
Portuguese women architects creating the future past Monteiro P.	303
Improvement of attractiveness of the living environment at Russian priority development territories Narezhnaya T., Orlov A.	309
Formation of a "green frame" of the city as a factor of sustainable development Pimenova G., Koptyaev D.	313
Implementation of avant-garde architectural theory and practice in architectural images of sci-fi cinema of late XX - early XXI century Rusiev K.	319
The issues contributing to the realization of abandoned industrial areas Sargsyan E., Arakelyan M.	323
Knowledge and fruition of the rupestrian monument between past and present Scalzo M., Giustiniani C.	329
The impact of urban environment on ecology an example of urban growth of the cities in northern Kazakhstan Semenyuk O., Chernysh N.	335
The classical tradition as the foundation of the future architecture Shvidkovsky D., Revzina Y.	339
The issues of city architecture. Tradition and the present time Sołkiewicz-Kos N.	343
Multi-purpose complex "The Great Silk Way" with Drama theatre, Ceremonial hall and Exhibition Center in the city of Taldykorgan in Kazakhstan Tatygulov A., Bairova S.	349
Assessment of vulnerability features of territories in the Republic of Armenia Tovmasyan S.	355
Territorial planning in up-to-date Russia: development and implementation issues Vaitens A., Mityagin S.	361
Urban spatial justice of intra-generations in Port Suva: another existential form of Neo-urbanism Wu X.	365
Investigation of development interaction between urban-rural fringe area in Beijing Yang A., Liu Z.	371

Landscape management in rural areas: Lithuanian case in global context Zaleskienė E., Gražulevičiūtė-Vilėniškė I.	377
--	-----

European and Polish developments in church stained glass art. Differences and similarities Żychowska, M.J., Białkiewicz, A.	383
--	-----

SESSION 3

Environmental engineering, energy, green buildings

Electromagnetoelastic waves in layered piezoelectric medium with electric screen Aghayan K., Danoyan Z., Atoyán L.	391
---	-----

The hyper concentrated mudflow structure dynamic impact forecast Gavardashvili G., Kukhalashvili E.	397
--	-----

Role of prosumer energy in energy supply to buildings Kurzak L., Satek R.	401
--	-----

Energy efficiency improvement of residential buildings during their major repairs and reconstruction Smirnov E., Drozdova I., Shestev E.	405
---	-----

Green rooftops in diversified urban landscape Tubielewicz – Michalczuk M.	409
--	-----

Tunnel sewer condition monitoring Vasilyev V., Vasilyev F.	413
---	-----

SESSION 4

Geotechnics, seismicity hazard analysis and prevention

Nonlinear continuous phase transition model of zonal disintegration of rock masses near deep-level tunnels Chen H., Qi C., Liu T., Yang J.	419
---	-----

Analysis of stability of slope based on fractal principle He J., Dong J., Chuan T., Chao W.	425
--	-----

Investigation of dynamical response of subway structures under the influence of the different underground water level Liu D., Dong J., Wang C.	429
---	-----

Consolidation behavior of layered clays considering soil structure Ma B.	435
---	-----

Free transverse vibration of long large-cross-sectional underground structure Qi C., Wei X., Liu T., Chen H., Yang J.	439
--	-----

Research on soil-long-underground-structure dynamic interaction under the action of shear wave propagates along axial direction of structure based on Pasternak foundation Xu C., Wang J., Qi C., Liu Y.	445
---	-----

Dynamic response of shallowly buried underground structure mid-pillar under vertical seismic excitation Yang J., Qi C., Wei X., Chen H., Liu T.	451
--	-----

The schemes of thermal tunnel through existing subway line 6 You T., Liu J., Wang F., Zhang L.	457
---	-----

SESSION 5

Construction, structural mechanics, transport problems

On taken into account the joint work structures and foundations Andreev V., Barmenkova E., Matveeva A.	465
---	-----

Influence of stress-strain state of reinforced concrete flat plate on its punching shear resistance Dadayan T., Avagyan H.	471
---	-----

Study of thermoelastic stiffness characteristics of double-layer conical washer Grigoryan A.	477
---	-----

On a class of contact problems and problems of the mechanics of cracks for piecewise homogeneous elastic bodies Kanetsyan E., Mkhitarian S., Mkrtyan M.	481
--	-----

Stability of elastic toroid-shape shells Karpov V., Panin A., Kharlab V.	487
---	-----

Gis-modelling of transportations in the logistical cluster of St. Petersburg Kotikov J., Evtukov S.	491
--	-----

Research on seismic dynamic response of submarine tunnel Liu T., Qi C., Chen H., Yang J.	497
---	-----

The failure mechanism and finite element analysis of recycled concrete two-way slabs strengthened with CFRP laminates Luo J., Du C., Zong Y., Liu J.	503
---	-----

Punching shear research on recycled concrete two-way slabs with anchor bolts Luo J., Zong Y., Du C., Liu J.	509
--	-----

High efficiency passive solar system and mathematical model for its calculation and design Melikyan Z.	515
---	-----

The modified method of rectangular finite elements with sixteen degrees of freedom for solving the problems of plate bending Pirumyan N., Gevorgyan G., Mehrabekyan N.	521
---	-----

The influence of the bottom ash from biomass burning on the properties of a concrete mix and concrete itself Rajczyk J., Pietrzak A.	527
The problems of accessibility of public services and transport links, caused by the geographical location of the cities in the Republic of Armenia Safaryan Y., Tovmasyan S.	533
Statistical methods of traffic safety assessment Vardanyan Y., Burnusuzyan S.	539
Investigation on the performance of silt stabilized by basalt fiber Wang J., Peng L.	543
Advance in investigation of size effect of quasi-brittle material Wei X., Qi C., Yang J.	549
Torsion of a prismatic compound rod made of materials having different anisotropic properties Yedoyan V., Aleksanyan R., Aleksanyan D.	555
FEM mechanical analysis of a large-span steel truss transfer in steel frame structure Zhao C., Guo Q.	561
Finite element analysis of the hysteretic behaviors on link-to-column connection using rib-stiffened plate for d-type eccentrically braced steel frames Zhao C., Guo Q.	565

SESSION 6

Technologies and operational methodologies for conservation

An analysis of the evolution of architectural metric survey by comparison of two surveys of Porta all'Arco (Volterra, Italy): from 1996 to 2014 Bevilacqua MG., Piemonte A., Caroti G., Martínez-Espejo Zaragoza I.	573
Thinking on issues of the protective zoning to the Confucius heritage in Qufu, China Ding Y., Liu L., Liu M.	579
Meditation to the conflicts of preservation to architectural morphology in Hui ethnic minority of Xi'an historic city Du B., Zhao L.	585
Evaluation criteria of a state of stone materials of ancient monuments under reconstruction Galstyan G., Arzumanyan A.	589
The adaptive reuse and reconstruction of the historical buildings of Yerevan Gasparian M., Vardanyan L.	595
Problem of preserving and development of national distinctive character in contemporary Arab architecture Houssin W., Zhmurko Y.	601

Project of reinforcement and restoration of Tigranakert basilic church in Artsakh Kirakosyan L.	605
Study on typical dependent structure of 400 years old - The Shibaozhai timber tower Linan L., Chao S.	609
Emergency integrated survey of the San Francesco basilica's attics and domes in Ferrara (Italy) Martínez-Espejo Zaragoza I., Caprioli F., Caroti G., Piemonte A.	613
The origins of the ornaments applied in early medieval Armenian architecture Mkhitarian N.	619
Social use of wooden architecture in Tomsk –Method of preservation of the unique phenomenon of world culture Romanova L.	625
Methodologies and techniques for the conservation of cultural heritage in emergency conditions Sabelli R.	631
Reconstruction of historical ruins – Rabsztyn Castle approach Broczyńska J.	637
Optimization of the geometric structure and kinematics of device for concrete surface treatment Urbański M., Szopa R.	641
Strategies on the protective zoning of historic ruins and the sustainability in economic developed city. A case study of the protective planning of Mudu historic ruins in Suzhou Wang X., Yue Y.	645

SESSION 7

The fruition of the heritage: cultural value-based travel, routes and landscape/New uses and enhancement of monuments

Creation of world cultural heritage buffer zone under the influence of a new paradigm Agisheva S.	651
Developing the ouv-based management plans for Iran heritage sites in urban and rural areas, case study: world heritage vision plan for the historical site of Khorheh Ahmadinezhad S., Vahidzadeh R., Vatandoust R.	657
The meaning of Parish houses in the villages and the small cities in the modern period Augustinková L.	663
Democratic evaluation of architectural heritage restoration and conservation projects Berni M.	669
Fighting poverty through forms of community based tourism in the territories of central Karakorum Bersani E.	673

Experiences of documentation and digital survey of some Unesco World Heritage sites	
Bertocci S.	679
Heritage site management considering Sandetsky Estate as an example	
Bureeva E.V., Kazymova T.S, Klescheva O.A., Nizamova A.S., Saifullina F.M.	685
Cultural heritage and creative industries: a comparative evaluation in Campania region (It)	
Forte F.	689
Journey in Ethiopia: the church of Beta Giyorgis in Lalibela	
Giustiniani C.	695
Defining an archaeological park: the restoring ancient Stabiae Foundation master plan 2001, and work since 2007	
Howe T.N.	701
Innovative methods to organize cultural tourism in Yerevan	
Kochar K.	707
Sado island the gold and silver mines in Japan. An integrated project between archeology and contemporaneity	
Niglio O.	713
Common ground between architecture and audio-visual language – a new tourist methodology	
Polainas A., Moreira Pinto L.	717
From the survey to the representation of cultural heritage: new spreading models for knowledge and dissemination	
Puma P.	721
Prerequisites and prospects of formation of ethnographic parks in the Republic of Armenia	
Safaryan A.	727
Importance of revitalization manmade landscape of Hrazdan Gorge of Yerevan and principles of future preservation	
Shahinyan S., Petrosyan S., Davtyan S.	733
On some issues of operating open air museums	
Stepanyan K.	739
Architectural and spatial development of the village Kony from XVI to XXI century	
Zueva I.	745
Keyword Index.....	751
Author Index.....	755

SESSION 1

CIVIL ENGINEERING, RECONSTRUCTION,
SUSTAINABLE CONSTRUCTION,
MATERIALS AND TECHNOLOGIES

EXPERIENCES OF DOCUMENTATION AND DIGITAL SURVEY OF
SOME UNESCO WORLD HERITAGE SITES

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Keywords

UNESCO World Heritage, survey, digital survey

ABSTRACT

The scientific results completed in two decades of experiences even in several sites classified by the UNESCO World Heritage List, from the Joint Laboratory of Landscape Survey & Design and the Laboratory of Survey LRA of the Department of Architecture of the University of Florence, have allowed us to bring together the most advanced technologies in survey knowledge for the digital documentation of the architectural and archaeological heritage. Are presented in this work a brief methodological summary of numerous studies, conducted in Europe, Asia and America, which have found their fullest expression in a more large corpus of studies conducted with international cultural cooperation and collaboration, as well as government institutions, with important cultural administration, universities and technical offices of the Heritage governance.

1. INTRODUCTION

Infographic technologies and digital detection systems, as it tends to show the exposition, can be profitably used in various different studies on the cultural, architectural and environmental heritage. In particular we offer many applications that are related to the management aspects of the extensive digital documentation that accompanies the research taking place in a specific site.

Due to the development and dissemination of innovative IT solutions for cultural heritage, nowadays are also to be taken into consideration, their preservation and maintenance in an environment of digital management. These technologies are essential for the documentation of the life cycle of an opera of the Cultural Heritage these contributions are functional to ensure highly effective for the management and its maintenance, as well as its use conscious. We are moving towards the integration of knowledge and existing structures (for example information systems of public and private institutions for the conservation, research centres and museums) and the role that the sector of digital documentation must cover may become increasingly relevant. The theme of the knowledge of heritage is of primary importance in the legislative framework which frames the UNESCO-protected World Heritage Site; through the numerous experiments developed and the various scientific contributions presented was carried out an initial survey of methodologies for the documentation of sites of interest that, in the context that we propose for the research, as well as becoming a qualified point of reference for researchers could be a meeting place for dealing the themes related to the issues of conservation and eventual recovery or reuse, of many sites, in line with what is prescribed by the Management Plans for UNESCO. In the exhibition are illustrated through digital surveys, virtual models, videos and drawings, the following of the UNESCO World Heritage sites, concerned by studies and surveys conducted by our research laboratory.

2. METHODOLOGIES

During these years we have developed a research group that has involved several specific knowledge of professors and researchers of the University of Florence and Pavia who have been able to consolidate relations with Italian and foreign institutions, on the basis of specific cooperation cultural agreements concerned, and to build relationships with companies interested in the development of technologies and applications specific to the development of research. It is evident that the collection of the experiences of documentation shows the maturation, during more than the last decade, of specific tools and knowledge processing and different results, obtained in post production phase, in relation to the specific needs of the architectural and archaeological heritage UNESCO World Heritage Site. A strategy of promotion of cultural heritage must be up to date in the objectives, strategies and purposes chosen.

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for these reasons must be based on a strong and modern apparatus of knowledge of the assets studied. Regardless of the type of intervention chosen is clear that a careful analysis of the data acquisition plays a fundamental role for the next address of each decision and an organic strategy on a real project of knowledge is the necessary premise of the project for the preservation and enhancement. The appearance of the documentation becomes even more important when the policy of conservation concerns both the physical object that the immaterial memory of the historical, artistic and cultural artefact that maintains and forward in time.

Years of experience in defining political, scientific and technical protection of cultural heritage in Italy show that is now overcome the phase of single cataloguing and location of the assets to be protected and it seems increasingly necessary to activate systems for the protection of cultural heritage and artistic more integrated and technologically advanced.

RESULTS

The scientific results completed in two decades of experiences in numerous UNESCO World Heritage Sites, before as a researcher and then as founding member of the *Laboratori Congiunto "Landscape Survey & Design"*¹, founded in the Department of Architecture of the University of Florence and recently joined also by the Department of Civil Engineering and Architecture of the University of Pavia, allowed experience the most advanced technologies in the field of survey for digital documentation of the architectural and archaeological heritage. All this knowledge is now involved also in the Laboratory of Survey LRA of the Laboratories of the Department of Architecture of the University of Florence named DIDALABS². Various studies conducted in nine countries (17 campaigns in protected heritage sites) in Europe, Asia and America³, were carried out especially in the perspective of a cultural international cooperation and in collaboration with government authorities and local administrations, as well as with the state authority of each nation and with the coordination of and administrative offices involved in Architectural Heritage. Through the synthesis of these works and studies, a singular overview can be offered to the scholars of this field, experiences materially built during the research surveys in heritage sites with architectural remains of archaeological interest, that show influences, connections or cultural and compositional models, and that required in depth analysis and, above all, the research of specific tools and knowledge processes and the elaboration of results gathered in relation to the particular context. All pledged to match the traditional and still indispensable direct and 'sight' survey, to the most innovative and sophisticated technologies, to define the relevant procedures, to develop and optimize the appropriate methodologies and specific protocols. Starting from the metric and formal detection of the monument, as first data of consistency of the architectural asset, it is possible for the searchers to reconstruct the thread of its story through the layering of the interventions since founding until today. Further analysis must be related to one another and with the measured shapes, to enrich the knowledge of the architecture. A specific expertise has been configured, unique in the world, based on a wealth of specialist knowledge and skills of the highest level. It is one of the true excellences of the Italian university system and of the entire country, and it was born experimentally working in the field. In the present work we present a number of case studies related with UNESCO heritage protected sites, examples of works produced by highly qualified experts and technology transfer centres that operate through a net of relationships with business enterprises, the Italian and foreign governments and other institutions³.

HERITAGE AND MANAGEMENT PLANS

The theme of the knowledge of Heritage is of primary importance within the legislative framework relating to the World Heritage Site protected by UNESCO⁴; through the various researches we undertook an initial census of the more proper methodologies for the documentation of the sites architecturally and historically of interest. In this context and for the development of the research, these methods can become a point of reference for scholars, and also be the purpose of the discussion with themes concerning conservation and possible restoration or re-use of many sites, in line with the requirements of UNESCO Management Plans. In order to highlight the importance of a proper management of the Heritage, in 2002, during its 26th session, the World Heritage Committee adopted the "Budapest Declaration".

All partners were exhorted to support the preservation of the World Heritage through some fundamental strategic objectives, trying to ensure a fair balance among conservation, sustainability and development. In this way the World Cultural Heritage can be protected through appropriate activities contributing to the socio-economic development and to the life quality in our communities; moreover through communication programs of actions and education, research, development and awareness strategies; finally, looking for an active involvement by local authorities, for the protection and management of the World Cultural Heritage.



Fig. 1 The survey project for the documentation of the external facades of Santa Maria del Fiore Cathedral in collaboration with the Opera del Duomo in Florence. It allowed the digitization of the entire surface of the exterior stones. Through digital survey systems and digital photogrammetric work, it has possible to store the documented material through G.I.S. systems and to propose, through 3D modelling, a vast interactive scene.

Responsible: Stefano Bertocci, Sandro Parrinello

Participants: Stefano Bertocci, Francesca Picchio, Matteo Ragazzini, Mirco Cantelli, Marco Lastrucci, Sandro Parrinello

Each request for inclusion in the World Heritage List must therefore include a management plan, with a complete description of the way to protect the unique value of the site. The primary objective of the management plan is to ensure an effective protection of the heritage, and to ensure its preservation to future generations. For this reason, the Management Plan should consider the typological differences, the characteristics and peculiarities of the site and of the cultural and/or natural environment where the heritage is located³.

It should also adopt the existing planning systems and/or other traditional methodologies of territorial organization and management. In the case of serial sites, and/or transnational sites, the Management Plan should ensure the coordination in the management of the single components of the site⁴. It is clear that the specific activities of our disciplinary field, survey but also drawing, are irreplaceable tools for descriptions analysis of formal, materials and structural features of a building and its context; the results of such activities are essential for the preliminary step of any project or program.

Nowadays, in a general context that considers the specificity and the skills of the surveying specialist useful for the conservation and restoration project, there is an increasingly great interest towards this profession in the field of archaeological researches, insomuch as to become an independent sector. Today the term "context" has cultural, chronological, but also spatial and environmental meanings: the architect, being an expert in describing events in terms of space and environment, can therefore be included with good reason among the scholars who, in the specific field of each archaeological research, have a key role like other professionals: experts in charge of the excavation and of recording the finds work together with archaeologists, historians, architects, restorers and laboratory technicians.

CONCLUSIONS

Based on the experience carried out in this specific field, operational protocols could be prepared, considering the complexity of the problem to define clearly even at a methodological level, because of continuous innovation offered by digital devices. However it could be important to use a reference methodology at an interdisciplinary level, shared with other fields and approved by UNESCO. Recent developments of legislation for the protection create buffer zones to protect the sites, instead of the past concept to simply define the boundaries of the territories of Heritage List.

These buffer zones are intended to reduce negative environmental or human influences, widening these areas more than before and including natural or cultural territories of minor interest to create an setting of the World Heritage protected.

The importance of buffer zones consists of the necessary protective measures, which define a new concept of preservation for each site, depending on the peculiar aspects of every area. Referential quality standards, concerning both protected complexes and areas included in the lists of heritage, and buffer zones of these sites, are present in the management plans of the sites.

Developments and dissemination of innovative IT solutions for cultural heritage, its preservation and maintenance are used to document works of cultural heritage and ensure its management as well as its aware and proper use.

We are moving towards the integration of knowledge and existing structures (for example, the information systems of public and private preservation institutions, research centres, museums, etc.) and therefore the disciplinary field of Drawing can have a more and more relevant role.

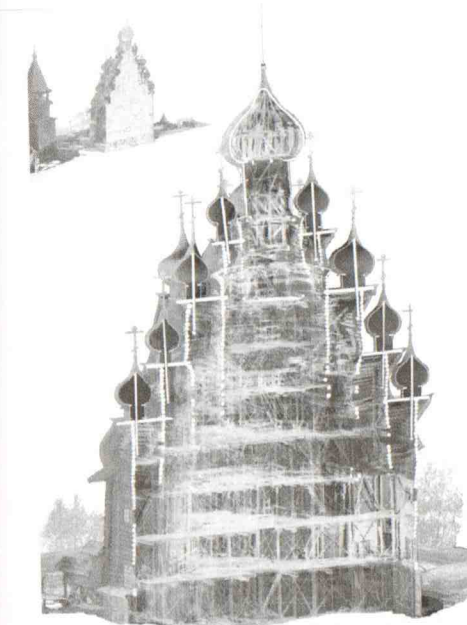


Fig. 2 The project concerns the Pogost complex, with a detailed and accurate analysis of the architectural and static structure of the Church of Trasfiguration for the study of conservative and restorative methodologies. The project focuses on general survey of the object through different methods: laser scanner survey, direct survey, general analysis, realization of a wide photographic campaign and detailed drawings analyzing from the general to the detail. The results consist in 2D and 3D drawings, digital databases, census archive and 3D reconstructions.
Responsible: Stefano Bertocci, Sandro Parrinello
Participants: Stefano Bertocci, Sara Porzilli, Andrea Pagano, Matteo Pasquini, Aurora Sorini, Sandro Parrinello.

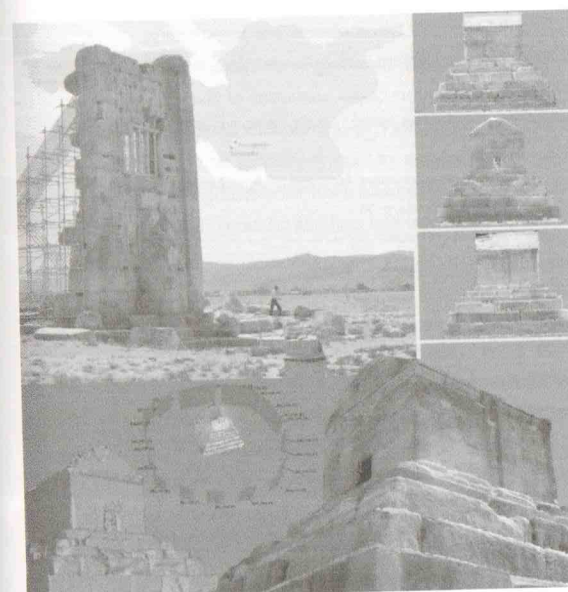


Fig. 4 The fast survey work carried out in the archeological site of Pasagradæ aims to the realization of 3D models of the most famous monument of the site, the tomb of Cyrus the Great, using data and pictures acquired during the survey. The monument, with a large square placed on a platform, has been entirely photographed in order to give back the conformation of the stone elements and the actual status of those.
Responsible: Stefano Bertocci, Sandro Parrinello
Participants: Stefano Bertocci, Matteo Pasquini, Francesca Picchio, Saeed Aman, Sandro Parrinello

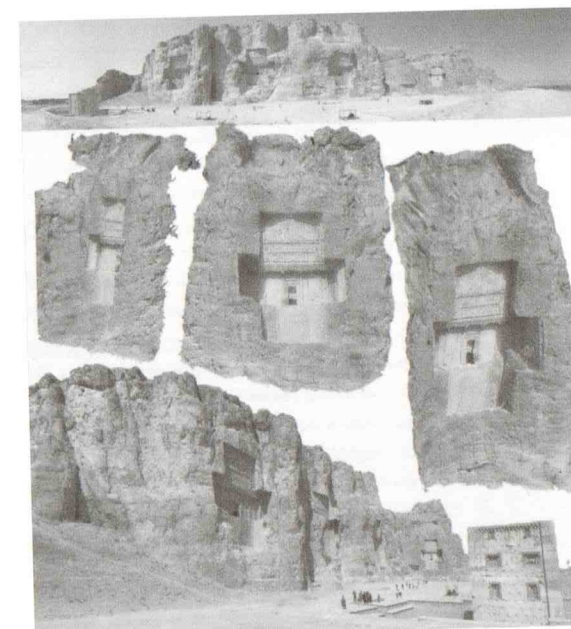


Fig. 3 The research mission in Iran, in the archeological site of Naqsh-e Rostam, provided for the survey of the four tombs of the Achaememid Kings Darius Xerxes I, Artaxerxes and Darius II, carved into the rock. The tombs, all at a considerable height from the ground and know as the "four Persian crosses", were photographed individually and for the entire extension with frontal and panoramic pictures of the plateau in order to obtain a highly reliable model, descriptive of the actual conservation of the site.
Responsible: Stefano Bertocci, Sandro Parrinello
Participants: Stefano Bertocci, Matteo Pasquini, Francesca Picchio, Saeed Aman, Sandro Parrinello

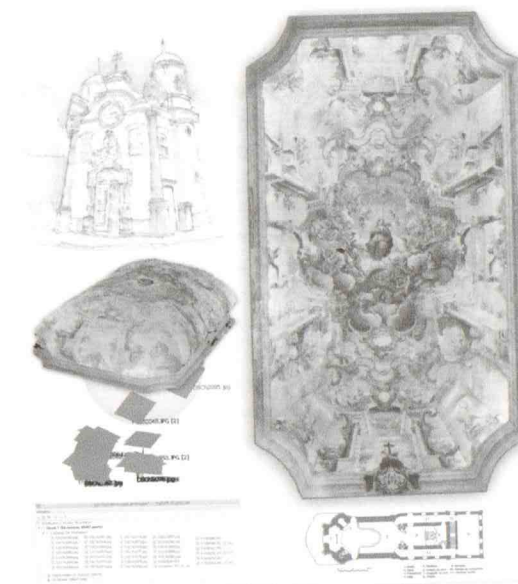


Fig. 5 The "Barocco Mineiro" expressed it's highest pictorial form in the vault of the church of St. Francis of Assis in Ouro Preto, considered as one of the "sete Maravilhas de Origem Portuguesa no Mundo".
The survey of the ceiling tested the accuracy of the latest technologies in metric data acquisition through three-dimensional photogrammetry. The 3D model has been necessary base to obtain some scientific considerations about translation of the rules of European Quadraturismo into Portuguese colonies in the late XVIII century.
Responsible: Stefano Bertocci, Sandro Parrinello
Participants: Stefano Bertocci, Silvio Van Riel, Fauzia Farneti, Graziella del Duca, Magno Moraes Mello, Susanna Mora Alonso-Munoyerro.

NOTES

¹ The Joint Laboratory of the University of Florence Landscape Survey & Design was founded in 2009 for applications and the development of technology related to the drawing and survey of architecture, landscape and urban areas.

Components, University of Florence: Department of Architecture - DIDA

Department of Agricultural Food Production and the Environment - DiSPAA

Component, University of Pavia: Department of Civil Engineering and Architecture - DiCAr

External partners companies: Piacenti Srl - Restoration Center (PO), Digtarca snc., (BA).

The research group is constituted by professors

Stefano Bertocci (DIDA), Rizio Tiberi (DiSPAA), Sandro Parrinello (Dicar).

² Laboratory of Surveying LRA offers students services Surveying the urban scale and architectural; the laboratory is able to offer services on the design of the 3D laser scanner survey, data acquisition and recording of the vector database acquired.

The products supplied will configure as point clouds recorded. The Laboratory of survey is also proposed as teaching structure of

specialist level offering courses aimed at 'learning methodologies through specific training courses: short courses, seminars, training courses and workshops, aimed at acquiring specific skills in the field of digital survey. Partnerships: CyArk (USA); SINECO (ITA), Microgeo srl, (ITA). <http://www.dida.unifi.it/vp-206-laboratorio-di-rilievo-dell-architettura.html>

³ List of UNESCO sites surveyed in 9 countries (17 campaigns in protected sites). Italy: the historical centre of Florence (1982), Piazza del Duomo in Pisa (1987), Hadrian's Villa in Tivoli (1998), Mantua (2008), Medici Villas and Gardens of Tuscany (2013). Israel: Masada (2001). Jordan: Petra (1985). Cuba: Castle of San Pedro de la Roca in Santiago (1997), Old Havana and its fortifications (1982). China: Great Wall of China. Panama, Portobello and San Lorenzo (1980). Russia: St. Petersburg's historic centre and its monuments (1990), Pogost of Kizji (1990), Veliky Novgorod (1992), Kazan Kremlin (2000). United States and Puerto Rico: Fortaleza San Juan, Puerto Rico (2011). Iran: Pasargadae (2012).

⁴ There are many rules in the field of international legislation preserving cultural and architectural Heritage. International treaty on 16/11/1972; Law n. 184, 6/04/1972; *Convenzione per la Salvaguardia dei Beni Culturali Immateriali*, approved on

17/10/2003; *Convenzione per la protezione e la promozione delle espressioni della Diversità culturale* approved on 20/10/2005. In Italian legislation: Decreto Legislativo n. 42, 22/01/2004 (in particular art. 133 and 143); Law n. 77, 20/02/2006, *Misure speciali di tutela e fruizione dei siti italiani di interesse culturale, paesaggistico e ambientale, inseriti nella lista del patrimonio mondiale, posti sotto la tutela dell'UNESCO*.

⁵ A Management Plan for a Unesco Heritage List defines the rules to protect and enhance a protected site. The analysis considers: territorial and city plan legislation, social and touristic development, lists of heritage. The second part consists in the Management

Plan: cultural promotion, planning for preservation, legislation for management (restoration, landscape protection and enhancement).

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HERITAGE SITE MANAGEMENT CONSIDERING SANDETSKY
ESTATE AS AN EXAMPLE

POSTER

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Keywords

heritage site management, architectural heritage, management plan, management strategies

ABSTRACT

Art Museum situated in Sandetsky estate in future should be included into touring routes. As a site it must be interactive, clear and understandable, must satisfy the latest scientific and technical requirements and must have recreational area. The Art museum must have an opportunity to enrich and renew exposition. The museum must become available for disabled people. The museum must host international scientific and practical events, round tables. That's why the article presents ways for reaching these goals through creation and implementation of management plan.

1. INTRODUCTION

Nowadays city heritage sites management is a topical issue. Under the influence of world integration great attention is paid to studying cultural features of regions. At the moment it is necessary to consider cultural heritage sites management mechanisms improvement regarding the possibilities of their commercial usage which provides their maintenance and development.

Under condition of globalization architectural heritage complex conservation principle in modern town planning demands to introduce state authorities' initiating, controlling and coordinating functions in partner relationship with local community, private sector and international community. The task of cultural heritage conservation should be solved not only by agencies responsible for monuments conservation but also those authorities which are responsible for town planning and architecture, economy and industrial development, ecology, transportation, providing public services and utilities, property complex, housing and communal services, etc

2. BACKGROUND

Architectural heritage sites nowadays have very important cultural and historical mission. They present not only one of the state cultural policy elements but an important factor of region's social and economical development. That's why the problem of architectural heritage site management lies in several fields and can be research subject for wide range of sciences. For example in the works of such economists as Asaul A.N., Vasileva L.S., Goremykin V.A., Grabovoi P.G., Gryaznova A.G., Ivanova N.V., Maksimov S.N., Mazur I.I., Kuschenko V.V., Lukmanova I.G., Oldergog N.G. and others some aspects of property management in big cities were considered.

Organizational and economical issues of cultural monuments conservation and usage, property management, providing resources for organizations dealing with culture, state expenses effectiveness and state property management improvement, creating and functioning of endowment funds are studied by Abankina T.A., Amunc D.M., Anuprienko V.J., Dymnikova A.I., Zagoskin D.V., Kudryavtseva T.P., Lagutin A.B., Lisitsky A.V., Malinina K.V., Sautin A.D., Starkov A.E. and others.

Historical property influence on urban environment conservation is considered in works of Slavina T.A., Sementsov S.V., Makhrovskaya A.V. and others.

The issues of real property items' conservation processes economics are revealed in works of Ripkem D., Malinina K.V., Kononenko T.V., Kuleshova M.E. However we should highlight that these works give general ideas on the topic and don't reflect special features of the region.