OSNOVI KONZERVACIJE KAMENA

-PRIMER OBRADE PREDMETA
U OKVIRU LETNJE ŠKOLE KONZERVACIJE
U MUZEJU PONIŠAVLJA U PIROTU-

THE BASICS OF STONE CONSERVATION

- CASE PROCESSING EXAMPLE
FROM THE CONSERVATION SUMMER SCHOOL
AT THE MUSEUM OF PONIŠAVLJE IN PIROT-

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Predgovor

Fondacija arhitekta Aleksandar Radović osnovana je 2016. godine radi trajnog čuvanja uspomene na lik i delo cenjenog arhitekte i konzervatora čije ime nosi.

Veliki deo svakodnevnice arhitekte Radovića, bio je usmeren na nesebičnu i svestranu podršku mladim ljudima, koji su tek kročili u svet konzervacije. Ideja da se kroz edukativne programe Fondacije nastavi ova plemenita i društveno-korisna aktivnost iz godine u godinu, privlači sve više i više pažnje.

Nakon dva međunarodna volonterska restauratorska kampa, koji su uspešno realizovani na Caričinom gradu u toku 2017. i u selu Gostuša 2018. godine, tokom avgusta meseca 2019. godine održana je i prva letnja škola konzervacije u Pirotu u Muzeju Ponišavlja.

Ova publikacija pruža uvid u osnove konzervacije kamena, kroz pregled relevantnih predavanja održanih u okviru teorijskog dela letnje škole, a za ovu priliku uobličenih u prigodne kratke tekstove, kao i kroz izveštaje o radu i konkretne primere primenjene metodologije i dobijenih rezultata. Takođe, još jedan od bitnih ciljeva jeste da se ukaže na važnost očuvanja predmeta i objekata izrađenih od kamena, te da se na jednom mestu predstave neki od ključnih problema i njihova moguća rešenja, kako za stručnjake, tako i za širu javnost.

Nasleđe je svuda oko nas i dostupno je svima. To je dobro, ali veoma često se iz razloga neznanja ili nedostatka pravih informacija, čak i sa dobrom namerom, na njemu čine nepopravljive greške.

"Osnovi konzervacija kamena", kao mala, ali sadržajna publikacija, informativnog je karaktera i ima za cilj da na jednostavan način, kroz teoriju i praksu, prikaže kako se može postupati sa kamenim predmetima, koji su u ovom slučaju deo muzejske zbirke, kako bi se oni adekvatno zbrinuli i sačuvali za buduće generacije. Upravo to je bio i cilj letnje škole iz koje je ova knjižica proizašla, uključujući i drugi, važan aspekt, a to je saradnja sa institucijama kulture i ostvarivanje konkretne pomoći.

Slični principi mogu se primeniti i na pojedinačne manje objekte i spomenike koji se nalaze na otvorenom prostoru, u svom originalnom okruženju ili na izmeštenim lokacijama, a modifikovani i u kombinaciji sa brojnim drugim oblastima, mogu se primeniti i na zgrade i druge objekte građevinarstva u određenim slučajevima.

Upravitelj Fondacije,
Elena Vasić Petrović

Foreword

The Architect Aleksandar Radovic Foundation was established in 2016 in order to permanently preserve the memory of life and work of our famous architect and conservator, whose name it carries.

Much of the architect Radovic's daily routine was focused on selfless and versatile support for young people who were just stepping into the world of conservation. The idea to continue this noble and socially beneficial activity, year after year, through the Foundation's educational programs attracts more and more attention.

After two international volunteer restoration camps, which were successfully implemented at Caričin grad during 2017 and in the village of Gostuša in 2018, in August 2019 the first Conservation Summer School was held at the Museum of Ponišavlje in Pirot.

This publication provides an insight into the basics of stone conservation, through an overview of relevant lectures held in the theoretical part of the summer school, and for this occasion summarized in appropriate short texts, as well as through work reports and specific examples of applied methodology and results obtained. Also, one of the important goals of the project is to emphasise the importance of preserving stone objects and artefacts, and to present in one place some of the key problems and their possible solutions, both for experts and for the general public.

Heritage is all around us and is accessible to all. This is good, but often because of ignorance or lack of the right information, even with good intentions, irreversible mistakes can be made.

"The Basics of Stone Conservation", as a small but rich in contents publication, is informative in nature and aims to demonstrate, through theory and practice, how stone objects, which are in this case part of museum collection, can be handled in an appropriate manner and preserved for future generations. This was precisely the aim of the summer school from which this booklet came, including another important aspect, namely cooperation with cultural institutions and the realisation of tangible assistance. Similar principles can be applied to individual smaller structures and monuments located outdoors, in their original environment or in displaced locations, and modified and combined with numerous other methodologies may apply to buildings and other structures in certain cases.

Director of the Foundation,
Elena Vasić Petrović

Izlaganja

Lectures

Uvod

Elena Vasić Petrović

Konzervacija kamena je široka oblast, koja zadire u najrazličitije segmente zaštite kulturnih dobara, pokretnih i nepokretnih, ali i svakodnevnog života. U isto vreme, njena problematika je veoma složena, dok rešenja konkretnih izazova veoma često leže u dugotrajnom procesu istraživanja, ispitivanja i analiza. Nisu zanemarljiva ni prethodna znanja i iskustva, a ponekad je pored konzervatora, arhitekata i građevinskih inženjera, potrebno i učešće većeg broja stručnjaka iz različitih naučnih disciplina (geologija, biologija, hemija, fizika...).
Većina dostupnih publikacija i članaka, uglavnom inostranih, ovu problematiku tretira, na visoko naučnom i stručnom nivou, pa kao takvi oni ne mogu poslužiti nekome ko tek počinje da se bavi ovom oblašću, upoznaje se sa konzervatorskim poslom ili se samo, kao laik, interesuje za određene stvari. Takođe, postoji i izvestan broj inostranih dokumenata, pravilnika i smernica, izdatih od strane međunarodnih ili nacionalnih organizacija, kao i nekoliko publikacija, koje pokušavaju da sistematizuju i urede ovu oblast, ali sve to neće doprineti podizanju svesti o konzervaciji, niti rešiti opšta pitanja iz ove oblasti.

Introduction

Elena Vasić Petrović

Stone conservation is a wide area, affecting the most diverse segments of tangible and intangible cultural heritage protection, but also everyday life.
At the same time, its problems are very complex, while solutions to specific challenges very often lie in a lengthy process of research, testing and analysis.
Prior knowledge and experience are also nessesary and sometimes in addition to conservators, architects and civil engineers, the participation of a large number of experts from different scientific fields (geology, biology, chemistry, physics ...) is also required.
Most of the available publications and articles, mostly foreign ones, treat this issue, at a highly scientific and professional level, so as such they cannot be of any use to anyone just starting out in the field, getting acquainted with the conservation business, or just being a layman interested in certain things.
Also, there are a number of foreign documents, regulations and guidelines issued by international or national organisations, as well as several publications that attempt to systematise and regulate this area, but these will neither contribute to awareness raising on conservation with the common people nor to addressing general issues in these area.

Osnovni principi konzervacije kamena

Elena Vasić Petrović, Dejan Rudić Vranić

Poznata nam je izreka da: "papir trpi sve", a verovatno ćete se iznenaditi činjenicom da to isto ne važi i za kamen. Na prvi pogled ne zvuči logićno, posebno ako se ima u vidu da su neke od najznačajnijih i najstarijih građevina i sačuvanih predmeta napravljeni upravo od ovog veoma trajnog i izdržljivog materijala, ali zaista jeste tako.

Problemi uglavnom nastaju, ili se intenziviraju već postojeći, kada dođe do određene intervencije na nekoj kamenoj strukturi.

Razumevanje nastalih oštećenja i negativnih uticaja, njihovo detektovanje i pravilna interpretacija, osnov su za početak razmatranja mogućih procesa u postupku konzervacije. Ovaj deo posla, kao i svaku sledeću etapu, uvek mora da prati adekvatna dokumentacija (fotografska, grafička, pisana...).

Odabir materijala koji će se koristiti, veoma je bitan. Ovo podrazumeva detaljno poznavanje okolnosti u kojima se predmet ili objekat nalazio pre pristupanja konzervaciji, ali i okolnosti u kojima će isti nastaviti da egzistira nakon toga.

Takođe, poznavanje vrste kamenog materijala, na kome će se raditi, kao i njegovih karakteristika i osobina, od presudne je važnosti za uspešno definisanje metodologije koja će se primeniti. Tako na primer, kada se odlučujete za način čišćenja, bilo bi idealno da poznajete pH vrednost koju sam materijal ima. Promena ove vrednosti, upotrebom hemijskih sredstava, može dovesti do negativnih uticaja na sam materijal i njegove karakteristike.

Dug je spisak materijala i sredstava, od pčelinjeg voska do epoksidnog lepka, koji su u nekom trenutku obilno korišćeni, da bi se kasnije ispostavilo, u praksi, da imaju negativna dejstva na kamen, te su kao takvi proglašeni za nepoželjne.

Suprotno pravilu da treba što više, preciznije i detaljnije izraditi dokumentaciju o konzervaciji, kada se radi o samim intervencijama važi sledeće: minimalni zahvati i od najjednostavnijeg ka složenijem! Naravno, upotreba kompatibilnih i reverzibilnih metoda i materijala je obavezna.

U praksi se često susrećemo sa veoma grubim i invazivnim postupcima, koji trajno narušavaju integritet kamenih artefakata. Najčešće se, u objektima izgrađenim od kamena koristi cement za razne popravke, koji predstavlja "neprijatelja broj 1" za ovaj materijal, ali i za druge koji mogu biti u

direktnom kontaktu sa njim.
Brojni su primeri da se delovi građevina od kamena, spomenici, zavetni i nadgrobni krstovi i drugi objekti "konzerviraju" i "prezentuju" tako što se postave u svež beton. Ovim smo najčešće trajno presudili kamenu i zagarantovali mu sigurnu degradaciju i raspadanje. Brzina procesa zavisiće samo od njegovog kvaliteta i karakteristika.
Kada je reč o spomenicima sa natpisima, često se dešava da se isti "retuširaju" neadekvatnim sredstvima, a neretko se i celi premazuju "masnim bojama". Kao i cement i beton, ova sredstva ne dozvoljavaju kamenu da "diše", ali mogu imati i veću čvrstću od samog kamenog materijala, te će svakako, pored izazivanja vidljivih mehaničkih i fiziških oštećenja, doprineti i njegovoj ubrzanoj strukturalnoj degradaciji.
U muzejskoj i konzervatorskoj praksi, u prošlosti je često i obilno korišćen čelik, za ankerisanje i spajanje kamenih elemenata. Čak i ako se ne desi da je on direktno izložen uticaju vode i atmosferskih prilika, vlaga koja se može naći u samom kamenu izazvaće u nekom trenutku koroziju metala i samim tim njegovo ekspandiranje. Stvaranjem sila pritiska unutar kamenog materijala, dolazi do njegovog oštećenja, pucanja i neminovnog raspadanja. Ovom procesu često pomaže voda koja, po istom principu, od mikroprslina u ciklusima zamrzavanja i topljenja, dovodi do ozbiljnih oštećenja.
Elementi od čelika koji su upotrebljeni na spoljašnjim delovima, takođe mogu izazvati oštećenja u smislu rasprostiranja korozije po kamenom materijalu, usled ispiranja vodom, i promenu boje na površini.
Ovakvi i slični štetni elementi moraju se obavezno ukloniti, ukoliko za to postoje uslovi, u što kraćem roku.
Ovde treba pomenuti i da su često predmeti istrgnuti iz konteksta, pogrešno interpretirani ili čak potpuno "izgubljeni", u smislu da nema podataka o njihovom poreklu, datovanju, nedostaju prevodi natpisa ili tekstova, a sve pod opravdanjem da ih treba "sačuvati".
Grešaka je bilo i biće, kako u institucijama, tako i kod "ljubitelja starina", ali ih svakako treba svesti na neku razumnu meru, jer je u današnje vreme informacija lako dostupna, a obaveza je stručnjaka da te informacije u pravoj formi, razumljivo i jasno prenesu na sve zainteresovane, isto koliko i da se sami na odgovoran i profesionalan način bave predmetnom problematikom.

Basic Principles of Stone Conservation

Elena Vasić Petrović, Dejan Rudić Vranić

A saying that: "paper bears all" is well-known, and you will probably be surprised that the same thing doesn't apply to stone. At first glance, it doesn't seem logical, especially considering that some of the most significant and oldest buildings and preserved objects are made of this very durable and strong material, but it really is.

Problems generally arise or the existing ones intensify, when some intervention occurs on a stone structure.

Understanding the damage that occured and negative impacts, their detection and proper interpretation are the basis for starting to consider possible interventions in the conservation process. This part of the job, as well as any subsequent stage, must always be accompanied by adequate documentation (photographic, graphic, written ...).

Choosing which material to use is also very important. This involves a thorough knowledge of the circumstances in which the object or building was located prior to approaching the conservation stage, as well as the circumstances in which it will continue to exist afterwards.

Also, knowing the type of stone material to be worked on, as well as its characteristics and properties, is critical to successfully defining the methodology that will be applied. So, for example, it would be ideal to know the pH value of the material itself when deciding on a cleaning method. Changing this value, using chemical agents, can lead to negative effects on the material itself and its characteristics.

There is a long list of materials and agents, from beeswax to epoxy adhesive, which at some point have been used extensively and than later on, in practice proved to have a negative effect on stone and have been declared undesirable as such.

Contrary to the rule that conservation documentation should be drawn up as precisely and in great detail as possible, the following applies to the interventions themselves: minimal interventions and from the simplest to the more complex. Of course, the use of compatible and reversible methods and materials is mandatory.

In practice, we often encounter very rough and invasive procedures that permanently impact the integrity of stone artefacts. Most often, in stone-built structures, cement is used for various repairs, representing "enemy number 1" for this material, but also for others who may be in

direct contact with it.
There are numerous examples of parts of stone structures, monuments, covenants and tombstones and other objects being "preserved" and "presented" by placing them in fresh concrete. With this we most often permanently damage the stone and guarantee it safe degradation and decomposition. The speed of the process will depend only on its quality and characteristics.
When it comes to monuments with inscriptions, it is often the case that they are "retouched" by inadequate means, and often the entire ones are coated with "greasy colours". Like cement and concrete, these agents do not allow the stone to "breathe" and they can have greater strength than the stone itself, so this will certainly contribute to its accelerated structural degradation in addition to causing visible mechanical and physical damage.
In museum and conservation practice, steel has been used extensively in the past for anchoring and joining of stone elements. Even if it does not happen to be directly exposed to water and atmospheric conditions, the moisture that can be found in the stone itself, will at some point cause corrosion of the metal and therefore its expansion. By creating pressure forces inside the rock material, it causes damage, cracking and inevitable decomposition. This process is often aided by water, which by the same principle, from micro-cracks, in freezing and melting cycles, causes serious damage.
The steel elements used on the outer parts can also cause damage by corrosion spreading on the stone material due to water leaching and discolouration. Such and similar harmful elements must be eliminated if conditions exist as soon as possible.
It should also be mentioned here that stone objects and artefacts are often taken out of context, misinterpreted or even completely "lost" in the sense that there is no information on their origin, dating, translations of inscriptions or texts are missing, all justified by the need to be "preserved".
Mistakes are made, and will be made, both in the institutions and with the "antiquity lovers", but they should certainly be reduced to some reasonable measure, because nowadays the information is easily accessible, and the obligation of the expert is to pass it on in the right form, understandable and clear to all interested parties, as much as to deal with the subject matter in a responsible and professional manner.

Deterioracija kamena

Ivana Cvetković

Ovaj rad daje kratak uvid u razmatranje mehanizama i procesa propadanja kamena, kao građevinskog materijala, koje se javlja u raznim formama. Ponekad su problemi vidljivi, kao na primer tzv.”plikovi” ili ispupčenja na površini. U nekim drugim slučajevima, kamen, na prvi pogled, može izgledati savršeno zdravo, dok je ispod površine izgubio svoju koheziju i čvrstinu.

Razvrstani po tipovima, najčešći problemi koji se mogu uočiti na kamenim objektima su: konstruktivni, strukturalni i estetski.

Konstruktivni problemi su povezani sa vrstom kamena upotrebljenim prilikom gradnje, a često se srećemo i sa lošom tehnikom zidanja. Na primer, loše izvedeni prevezi krajnjih, ugaonih blokova na objektima, mogu dovesti do odvajanja celokupnih vertikala zgrada. Takođe, loše izrađeni detalji povezivanja lica zidova sa sredinom zida, mogu dovesti do dezintegracije jezgra[1]. Odabir odgovarajućeg kamena za određeni građevinski ili bilo koji drugi element je veoma važan. Ukoliko odaberete kamen koji nema adekvatne karakteristike, a izložen je atmosferskim uticajima, to će sigurno stvoriti probleme tokom vremena. Slab vezivni materijal između kamenih elemenata nanosi štetu, a stvara se kada malter izgubi svoja svojstva, takođe, malter koji je znatno čvršći od samog kamena nije dobro rešenje, jer će ubzati njegovo propadanje. Upotreba neodgovarajućih materijala, naročito prilikom popravki, predstavlja čest problem[2]. Tako na primer, upotreba cementnog maltera za fugovanje ili dersovanje spojnica između kamenih elemenata može prouzrokovati nastajanje prslina i pukotina na originalnom materijalu. Atmosferske prilike (vlaga, zagađenje, ciklus “smrzavanje-odmrzavanje”, temperaturne razlike), kao i vatra, poplave i sl. imaju veliki uticaj na propadanje kamena.

Strukturalni problemi vezani su za degradaciju unutar samih kamenih blokova ili na njihovoj površini, kada se isti mogu često podvesti istovremeno i pod estetske, a razvrstavaju se u nekoliko podgrupa, čiji opisi slede dalje u tekstu.

Prvo ćemo pomenuti frakture (mikro-prsline, zvezdaste prsline i pukotine), koje predstavljaju oštećenja vidljiva golim okom, a njihovo prisustvo vodi ka odvajanju delova kamena.

Odvajanja i gubitak materijala predstavljaju razdvajanje i razlaganje kamenog materijala, različitih tipova i količina, kao što su nastanak

tzv.”plikova”, rasprskavanja, “pilling” ili mikro-odvajanje, dezintegracija, fragmentacija i ljuskanje. Najšešće gubitak materijala može biti izazvan mehaničkim oštećenjima, već postojećim nedostajućim delovima, kao i raznim perforacijama. Čest Indikator strukturalnih problema su i promene boje i nastajanje naslaga (inkrustracije, film, patine i zaprljanja). Sve naslage nastaju akumulacijom materijala na površini kamena ili kombinovanjem dodatnog materijala sa onim dobijenim iz samog kamena nekim hemijskim procesom (kore i inkrustracije). Procvetavanje se ispoljava kao naslaga u formi “pudera” ili kristala na samoj površini kamena. Gubljenje ili promena može se definisati kroz tri parametra: nijansa, čistoća i intenzitet. Film predstavlja tanak površinski sloj, različitog porekla i homogenog karaktera, dok je patina hromatska modifikacija materijala i u najvećem broju slučajeva ne smatra se procesom degradacije[3].

Biološka kolonizacija je naseljavanje kamena od strane biljnih ili nekih mikroorganzama(alge, bakterije, gljivice). Alge su najčešće mikroskopski sitne, nemaju stablo, niti listove, i vidljive su samo kao naslage. Lišajevi formiraju okrugle ili nepravilne forme koravih i žbunastih naslaga. Mahovine formiraju male, mekane, zelene forme, nalik na jastučiće. Plesni su mikroorganizmi koji kolonizuju površinu, a pregledom golim okom uočavaju se kao film, odnosno mrežasta ili zvezdasta zakrpa u raznim bojama (bela, zelena, siva)[4].

Ukoliko se objekti i zgrade ne održavaju, biološka kolonizacija preovladava, zahvata ih u celosti, a posebno brzo se razvija u delovima gde su voda i vlaga lako dostupne. Tako se može desiti da se tu razviju i kompletni biljni sistemi, uključujući i drvenaste forme, čije se korenje se pruža kroz spojnice i pukotine i na kraju izaziva destabilizaciju i urušavanje čitavih zidanih struktura i objekata.

Degradacija kamena je dobro poznata svakome ko se ikada zagledao u neku istorijsku zgradu, napravljenu od ovog materijala, ili u neki kameni spomenik. Iako postoji mali broj vrsta kamena na koje vekovi izloženosti raznim uticajima ne utiču, većina njih je uvek u postepenom propadanju. Veliki broj objekata svetskog kulturnog nasleđa izgrađen je od kamena, i oni lagano nestaju. Zato, moramo biti sposobni da opišemo i okarakterišemo propadanje kamena. Dalje, potrebno je da razumemo uzroke i mehanizme njegovog propadanja. Samo tada možemo se nadati da ćemo smanjiti ili sprečiti propadanje kamena i sačuvati naše nasleđe[5].

1Vasić, Č., Momčilović-Petronijević, A. (2011): Konzervatorski problemi Caričinog grada i mogućnosti prezentacije. Glasnik društva konzervatora Srbije, br. 35, str. 205-209. Beograd, Srbija.

2 TU Delft (Delft University of Technology), 2009, EU Project Desalination: Assessment of desalination mortars and poultices for historic masonry.

Stone Deterioration

Ivana Cvetković

This paper gives a short introduction to consideration of decay mechanisms and deterioration processes of stone. Stone decay takes many different forms. Sometimes the surface erupts into blisters, or the it loses all integrity and simply crumbles away. Sometimes the stone may look perfectly sound to the naked eye, while below the surface it has lost its cohesion and strength.

Most common stone problems can be classified into: constructive, structural and aesthetic.

Constructive problems are related to the stones used in the building process. The most common construction problems are poor building technics. Poorly placed stone blocks at the corners can lead to the separation of whole vertical parts of the building. The bad details of bonding wall face with the middle part of the wall can lead to disintegration of the core of the wall[1]. Poor stone selection can cause various problems. Choosing the right stone for a certain building element is very important. If you choose a stone with inadequate properties and it is exposed to weather conditions, this will certainly be a problem over the time. Weak mortar bonding between the elements also causes damage, as well as material which has greater strength than the stone itself because it will accelerate its deterioration. The use of inappropriate materials, especially during repairs, is a common problem[2]. So, for example, the use of cement mortar for grouting or dressing joints between stone elements can cause cracks in the original material. Atmospheric conditions (humidity, pollution, freeze-thaw cycle, temperature differences), as well as fire, floods, etc. have a great influence on stone decay.

Structural problems are related to the degradation within the stone blocks themselves or on their surface, when they can often be recognised at the same time as the aesthetic ones, and are grouped into several subgroups, the descriptions of which are described below.

First, we will mention fractures (micro-cracks, "star" cracks and cracks), which represent damages visible to the naked eye, and their presence leads to the separation of parts of the stone. Separation and loss of material represents the decomposition of stone material of different types and quantities, such as the formation of so-called "blisters", bursts, "pilling" or micro-separation, disintegration, fragmentation and "flaking".

The most common loss of material can be caused by mechanical damage, missing parts as well as various perforations. A common indicator of structural problems are also discolouration and buildup (incrustation, film, patina and soiling). All deposits are formed by the accumulation of material on the surface of the stone or by combining additional material with that obtained from the stone itself by some chemical process (bark and incrustation). Enlightenment is expressed as a deposit in the form of "powder" or crystal on the surface of the stone. Loss or change can be defined through three parameters: hue, purity and intensity. The film is a thin surface layer of different origin with homogeneous character, while patina is a chromatic modification of the material and in most cases is not considered to be a degradation process[3].

Biological colonisation is the settlement in the stone by plant or some micro-organisms (algae, bacteria, fungi). Algae are usually microscopically tiny, have no tree or leaves and are only visible as deposits. The lichens form round or irregular forms of brown and bushy deposits. The mosses form small, soft, green, pad-like shapes. Molds are micro-organisms that colonise the surface and are visible to the naked eye as a film, that is, a mesh or star patch in various colors (white, green, grey) [4].

If facilities and buildings are not maintained, biological colonisation prevails, engulfing them entirely, and especially rapidly developing in parts where water and moisture are easily accessible. Thus, complete plant systems may also develop, including woody forms, whose roots extend through joints and cracks and ultimately cause destabilisation and collapse of entire masonry structures and buildings.

The degradation of stone is well known to anyone who has ever gazed at a historic building made of this material or a stone monument. Although there are few types of stone that are not affected by centuries of exposure to various impacts, most are always in gradual decay.

A large number of World Heritage sites are made of stone and they are slowly disappearing. Therefore, we must be able to describe and characterise stone decay. Further, we need to understand the causes and mechanisms of its decay. Only then can we hope to reduce or prevent the stone from collapsing and to preserve our heritage ".

3 ICOMOS-ISCS: Illustrated glossary on stone deterioration patterns/Glossaire illustré sur les formes d'altération de la pierre, MONUMENTS AND SITES/MONUMENTS ET SITES

4 Idem

5 Doehne, E. and Price, C. (2010): Stone Conservation, An Overview of Current Research, Second Edition, The Getty Conservation Institute, 48, Los Angeles. USA

Mapiranje spomenika

Nevenka Novaković

Brojni istorijski, ali i savremeni spomenici kulture, izgrađeni u potpunosti ili delimično od prirodnog kamena, pretrpeli su ozbiljna oštećenja kao posledicu procesa prirodnog vremenskog raspadanja pod uticajem atmosferilija, aerozagađenja, izmenjene namene, korišćenjem neadekvatnih reparatornih materijala ili najčešće usled neodgovarajućeg i nedovoljnog održavanja. Proučavanje vremenske trajnosti ugrađenog kamena, identifikacija formi raspadanja i otkrivanje uzroka njegove razgradnje su osnova za pravilnu sanaciju oštećenja i mogućnost kontrole faktora i dinamike daljeg raspadanja. Pogrešno izabrani i/ili neodgovarajući zamenski materijali, mogu ubrzati proces propadanja originalnog kamena. Kompatibilnost originalnog kamena sa zamenskim materijalima je predmet brojnih istraživanja i predfaza bilo kog restauratoskog procesa (Beck & Al-Mukhtar, 2010; Nijland et al., 2010; Graue et al., 2011).

Pristupajući obnovi spomenika kulture sprovodi se nekoliko bazičnih koraka. Pre svega radi se na anamnezi koja podrazumeva identifikaciju spomenika, lokaciju, sagledavanje sa aspekta istorije umetnosti, okruženja. Potom se sprovode dijagnostički postupci: od čega je spomenik izgrađen, osobine materijala, stepen oštećenja, faktori i procesi koji dovode do oštećenja, potreba i hitnost preduzimanja mera tehničke zaštite. Po završenoj dijagnostici pristupa se konkretnim merama na konzervaciji, restauraciji, rekonstrukciji ili sanaciji spomenika.

Dijagnostičke metode se dele na „in situ“ istraživanja, laboratorijska ispitivanja i simulacije propadanja. U “in situ” istraživanja spadaju mapiranje spomenika, merenja i uzimanja uzoraka. Laboratorijske analaze se odnose na fizičke, hemijske i mehaničke osobine materijala, dok se simulacija propadanja može odvijati u prirodnim uslovima ili u specijalnim klima-komorama.

Mapiranje spomenika predstavlja nedestruktivnu, ekonomičnu dijagnostičku proceduru, koja se preporučuje kao rutinska metoda na polju konzervacije spomenika kulture. Efektivna i ekonomski isplativa dijagnostika je izuzetno važna. Mapiranje spomenika predstavlja u tom smislu izuzetno poželjan model jer je moguće mapirati različite litotipove, od kojih je spomenik izgrađen, klasifikovati i obeležiti sva oštećenja prema tipu, jačini i distribuciji. Ova metoda omogućava praćenje konzervatorskih postupaka i dugoročno praćenje promena na spomenicima. Postoji mnogo različitih metoda za mapiranje kao što su “UNI NORMAL”, “ICOMOS-ISCS glossary”, Radna grupa “Natural stones and weathering” sa Tehnološkog univerziteta u Ahenu i dr. Ali ono što je važno je da su to sve samo preporuke, a da svako može napraviti svoju klasifikaciju prilagođenu svakom pojedinačnom slučaju. U tim situacijama neophodno je dobro obrazložiti predloženu klasifikaciju kako bi njena upotreba bila jasna korisnicima i učesnicima u procesu konzervacije.

Pri prvom susretu sa mapiranjem oštećenja na kamenu polazi se od najuočljivijih i opšte poznatih formi raspadanja (crna kora, nedostajući delo-

vi, isoljavanje, mehanička oštećenja, biološka kolonizacija…). Tipologija će se razlikovati od spomenika do spomenika. Nakon detaljnog pregleda spomenika/objekta, pristupa se popisivanju svih uočenih oštećenja. Svako oštećenje dobija oznaku grafičkog prikaza u vidu boje ili šrafure koja će se pojaviti u legendi koja treba da prati svaki grafički prikaz. Nakon toga na crtežima ili fotografijama se obeležava svako oštećenje, u skladu sa odabranim grafičkim prikazom. Na ovaj način obrađen predmet pomaže nam da sprovedemo evaluacione metode kojima se dodatno mogu pojasniti uzroci i način propadanja. Tako se oštećenja mogu posmatrati u odnosu na položaj i orijentaciju objekta u prostoru, u odnosu na druge objekte itd. (na primer: pojava mahovine-biološka kolonizacija na severno orijentisanoj fasadi, pojava crnih kora na strani izloženoj ulici, pojava isoljavanja u odnosu na tragove curenja vode…). Dodatno može se pristupiti procentualnom izračunavanju površina pod određenim degradacionim procesom i planiranju materijala potrebnog za restauraciju. Mapiranje oštećenja omogućava lako upoređivanje i praćenje stanja jer se procedura može nesmetano ponavljati u potrebnim vremenskim razmacima. Dodatne mogućnosti, koje donekle usložnjavaju proces i zahtevaju veći stepen znanja, omogućavaju klasifikovanje oštećenja uz upotrebu merljivih parametara (kao što su debljina kore, procenat površine ljuspanja...) i formiranje podgrupa i nivoa koji na kraju rezultiraju matematičkim izračunavanjem indeksa propadanja pomoću kojih je moguće ustanoviti stepen i progresivnost, samim tim i potencijalnu opasnost, kao i hitnost intervencije.

Mapiranje kamena podrazumeva vizuelno opažanje, a potom prenošenje svih obeleženih nedostataka i obradu u različitim softverima. Mapiranje se može obeležavati na fotografijama u Photoshop-u, zatim na crtežemi u AutoCAD-u, ali i u specijalizovanim programima za mapiranje, kao što je METIGO map, koji su prilagođeni konzervatorima i ne podrazumevaju preterano poznavanje vektorskih programa.

Poznavanje formi degradacije od presudnog je značaja za postizanje pravilnog konzervatorskog tretmana, a mapiranje, osim što omogućava veliku preciznost i razumevanje tih formi predstavlja veoma važan segment konzervatorskog posla, a to je upravo dokumentovanje dragocenih podataka koji će služiti kako konzervatorima savremenicima tako i narednim generacijama koje će brinuti o nasleđu.

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Monuments Mapping

Nevenka Novaković

Many cultural monuments, historical and new, made completely or partially of natural stone, have sustained significant damage due to the processes of natural ageng and decay caused by climate change, pollution, use demands, lack of maintenance and inappropriate past treatments. The study of the durability of the built-in stone, the identification of the forms of decay and its causes are the key for the proper repair of the damage and the possibility of controlling the factors and progression of further decay. Incorrectly selected and /or inadequate replacement materials can speed up decay process of the original stone. Compatibility of replacement materials with original stone has been the subject of numerous research and pre-stage of any restoration process (Beck & Al-Mukhtar, 2010; Nijland et al., 2010; Graue et al., 2011).

Approaching the restoration of cultural monuments, several basic steps are being taken. First of all, anamnesis takes place, which involves the identification of the monument, the location, the aspect of art history, the environment. Diagnostic procedures then are carried out: investigation of building materials, the material properties, the degree of decay, the factors and processes that lead to the damage, need and urgency of taking protection measures. Upon complete diagnosis, concrete measures are taken to preserve, restore, reconstruct or recondition the monument. Diagnostic methods are divided into in situ investigations, laboratory analyses and weathering simulation. In situ research includes monument mapping, measurements and sampling. Laboratory analyses refer to the physical, chemical and mechanical material properties, while the weathering simulation can take place in natural outdoor conditions or in special climate chambers.

Monument mapping represents a non-destructive, economic diagnostic procedure, which can be recommended for routine application in the field of monument preservation. Effective and economic monument preservation requires a reliable diagnosis of stone materials and stone damages. Monument mapping comprises registration and mapping of lithotypes, classification and mapping of weathering damages according to type, intensity and distribution, illustration of results in monument plans and evaluation of results obtained from mapping. Monument mapping allows certification of preservation measures and long-term observation of monuments.

In the attempt to harmonise classification approaches and overcome terminology problems, various systems have been established (Normal 1/88, 1990, ICOMOS-ISCS 2008, a comprehensive monument mapping method developed by the working group ‘Natural stones and weathering’ / Aachen University of Technology (Fitzner, Heinrichs and Kownatzki 1995, Fitzner, Heinrichs and Kownatzki 1997). However, glossaries can be only recommendations and anyone can make his own classification tailored to each case. In these situations, it is necessary to justify the proposed classification in order to make its use clear to users and participants in the conservation process.

The first steps in monument mapping starts with the most obvious and commonly known forms of decay (black crust, missing parts, efflorescence, mechanical damage, biological colonisation...). Typology will change in all the cases. After the precise inspection of the monument/object all the identified weathering forms are being listed. Every single weathering form is marked with a different coluor or hatch pattern and they will appear in legend which will follow all the graphical drawings. After that process all the weathering forms are clearly marked on the photos or drawings. This way treated objects help us to carry out evaluation methods that can further clarify the causes and manner of decay. Damages can be observed related to position and orientation of the object in location; regarding other objects etc. (for example presence of moss on the north façade, black crust on the street oriented façade, traces of effloresces and water leaking). As an addition percentage calculations of groups of weathering forms are possible and planning of quantities of restoration material can be preformed. Damage mapping makes it easy to compare and monitor the condition as the procedure can be repeated at required intervals. Additional, more complicated features which require a greater degree of knowledge enable the classification of damage by measurable parameters such as crust thickness, percentage of scaling, and formation of subgroups and levels. Quantification of damage intensities and determination of damage categories and damage indices allow conclusive quantification and rating of stone damage for entire stone monuments and judgment of need and urgency of intervention.

Monument mapping is performed by visual observation and then recording all the decay forms and processing in different software. Mapping can be done on the photographs in Adobe Photoshop, on the drawings in AutoCAD, but also in specialised programs for mapping as a METIGO map software which are customised for conservators and do not imply excessive knowledge of vector programs.

Knowing the weathering forms is crucial to achieving the right conservation treatment, and monument mapping apart from providing great precision and understanding of these forms is a very important segment of the conservation work which is to document valuable data that will serve conservationists and future generations who will take care of the heritage.

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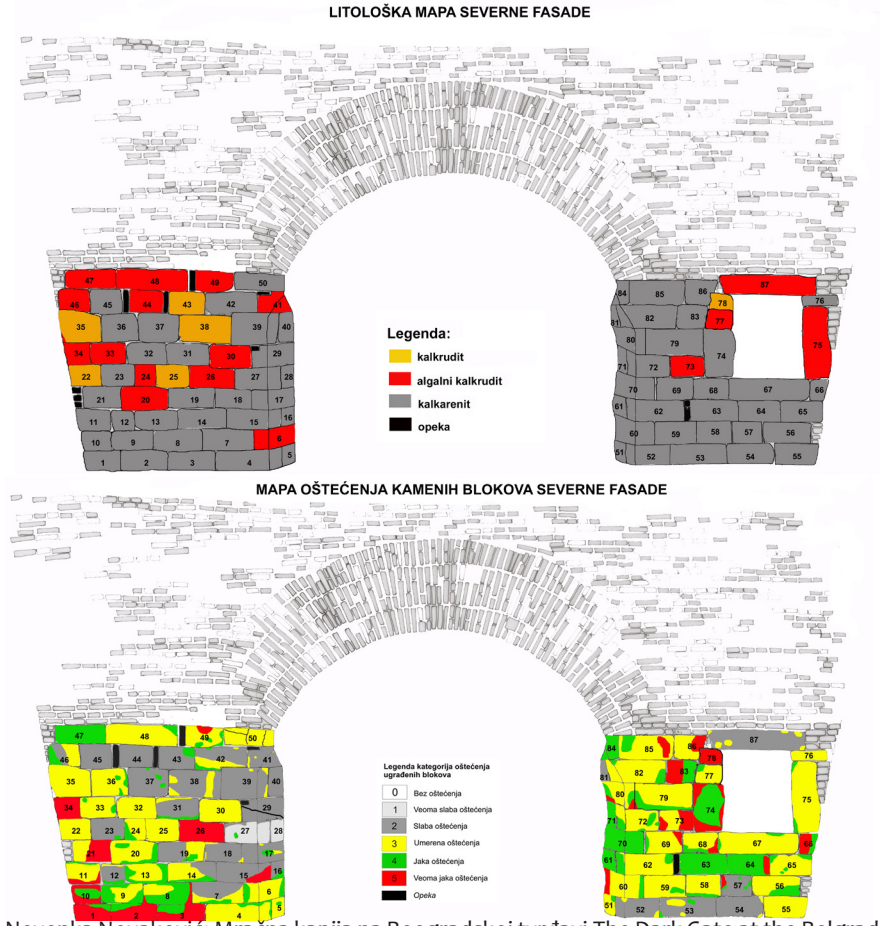
Ilustracije / Illustrations

Ivana Cvetković: a/ Inapproprite Choice of Stone Type/Pogrešan izbor kamena; b/ Weak Mortars-Slab Malter; c/ Biological Colonisation-Biološka kolonizacija



Nevenka Novaković: Mračna kapija na Beogradskoj tvrđavi-The Dark Gate at the Belgrade Fortress - a/ Litological Map-Litološka mapa; b/ Degradation Map-Mapa oštećenja

Prilog A

Appendix A

Upravljanje zbirkama - osnovni standardi i obaveze

Milena Milošević Micić

Upravljanje zbirkama može biti definisano kao skup strategija, politika, procesa, planova i postupaka uključenih u pristup, upotrebu, čuvanje i razvoj zbirke (skup predmeta i materijala koji su sastavljeni, klasifikovani, odabrani i sačuvani u bezbednom okruženju zbog svojih umetničkih, istorijskih, naučnih i/ili drugih vrednosti).

Upravljanje zbirkama je od vitalnog značaja za razvoj, organizaciju i njihovo očuvanje. Ne uzimajući u obzir vrstu i specifičnost zbirki, koje mogu biti različite po veličini, materijalu itd., upravljanje treba koristititi i primenjivati u bilo kojoj javnoj ili privatnoj instituciji i organizaciji, ili u slučaju kada su vlasnici privatna lica i, kao takvi, odgovorni za zbirke. Ono je u direktnoj vezi sa brigom o zbirkama, koja se uglavnom odnosi na njihovu fizičku zaštitu, ali i na dugoročno obezbeđivanje povoljnih uslova za njihovo čuvanje i bezbednost.

Upravljanje zbirkama predstavlja složenu grupu aktivnosti čiji je cilj: stvaranje optimalnih uslova za razvoj zbirke, briga o njoj, pristup, upotreba i uopšte čuvanje zbirki kroz vođenje prateće dokumentacije. Trebalo bi upravljati zbirkama na način kojim bi se podržala misija i svrha muzeja.

Razvoj zbirki podrazumeva: utvrđivanje misije i pravila zbirke; vođenje evidencije i dokumentovanje; odabir, sakupljanje, nabavku; definisanje pravila u odnosu na vrste objekata koje treba sakupljati, po kojim kriterijumima i na koji način; veličinu, obim, broj predmeta u zbirkama; pravila i politike za sticanje, raspolaganje, zajam, prenos i na kraju kako zbirke treba komunicirati, predstaviti i interpretirati.

Briga o zbirkama bavi se pitanjima bezbednosti kao što su: uslovi u depoima i prostorijama za odlaganje, korišćenje materijala, fizička zaštita, ali i preventivna i aktivna zaštita.

Zatim, upravljanje rizicima obuhvata: sigurnosne procedure i planove evakuacije u slučaju vanredne situacije, polise osiguranja itd.

Upravljanje zbirkama takođe određuje pristup zbirci i njenu dostupnost, kako za naučnike, tako i za publiku, kroz organizaciju zbirki.

Organizacija zbirki podrazumeva procedure dokumentacije, katalogizovanja i registrovanja, lokalizaciju predmeta iz kolekcije u skladištima i izložbenim prostorima, kao i njihovu manipulaciju, rukovanje i digitalizaciju.

Upotrebu zbirki treba razumeti kao procese, koji se organizuju i sprovode kroz izložbe, obrazovanje i usluge koje se baziraju na vrsti zbirke. Takođe, to može značiti njihovu naučnu i komercijalnu upotrebu (dozvole i naknade), razvoj i upotrebu digitalnih alata, interneta i razne promotivne i

turističke aktivnosti.
Upravljanje zbirkom se može razumeti i odrediti i kao jednostavan skup standarda u svakodnevnom poslu.
Minimalni standardi ispunjeni u upravljanju kolekcijom odnose se na dokumentaciju o svakom predmetu, koja treba da sadrži sledeće podatke: ime-vrsta, atribucija, datum, materijal, tehnika, mere, podaci o poreklu; fotografija, digitalna fotografija, inventarni broj, identifikacioni karton predmeta; odgovarajući prostor za predmet, s obzirom na materijal, veličinu, težinu, stanje; jasno naznačena pozicija na kojoj se predmet nalazi, pravilno skladištenje, lako nalaženje i rukovanje; odgovarajuća dokumentacija koja čuva i prati sve promene na predmetu, u pogledu oblika, stanja, premeštanja, pozajmljivanja, izlaganja, očuvanja; odgovarajuće mere za upravljanje rizikom i vanrednim situacijama; preventivna zaštita, transport, pakovanje i rukovanje prilikom izlaganja; politika izlaganja, predstavljanja i komuniciranje zbirke, kao i njena održiva upotreba.
Potrebno je u kontinuitetu voditi evidenciju o politikama prikupljanja i upravljanja zbirkama, rezultatima i ishodima upravljanja i korišćenja zbirki, kao i redovno procenjivanje i analiza situacije, kako bi se održavali uslovi optimalnog stanja zbirki.

https://icom.museum/en/ressource/running-a-museum-a-practical-handbook/
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Collection Management - Basic Principles and Obligations

Milena Milošević Micić

Collection Management can be defined as a set of strategies, policies, processes, plans and procedures involved in access, use, care and development of collections (set of items, materials assembled, classified, selected and preserved in safe setting because of their artistic, historical, scientific or any other values).

Collection management is of a vital importance for the development, organisation and preservation of the collections. Disregarding the sort and specificity of collections which may vary in size, material, etc., collection management should be used/applied in any public or private institution/organisation, or in case of private individuals with the legal ownership or responsibility of a collection. It is in close connection with collection care concerning mainly on physical preservation but also on long-term wellbeing and safety.

Collection management represents a complex group of activities in order to create optimal conditions for: collection development, care of collection, access to collection, use of collections and in general preservation of collections through the process of record keeping. It should be managed in a way to support the museum's mission and purpose.

Collection development deals with: the collection mission and legislation; record keeping and documenting, selection, assembling, acquisition (which types of objects should be collected and under which criteria and how); size, scale, number of objects in collections; rules and policies for acquiring, disposal, loan, transfer; and finally how the collections should be communicated, presented and interpreted.

Care of collection treats safety issues such as: storages: space, conditions, materials, physical protection, but also preventive and active conservation; risk management: security and emergency plans, insurance policies.

Collection management also determines access to collection (both for scientists and public audience) through organisation of collection. Organisation of collections implies documentation procedures, cataloguing and registrar, localisation of collection items and artefacts in storages and in exhibition spaces, manipulation and handling, digitizing.

Use of collection should be understood as processes organized and implemented through exhibitions, education, collection based services. Also, it can represent their scientific and commercial use (permits and fees), development and use of digital tools and internet and various promotional and tourist activities.

Collection management can be also understood and determined as a simple set of standards for everyday use. The minimum of the standards met in the collection management should be a documentation about each object: name/sort, attribution, dating, material, technique, measures, information about the origin, etc. photo, digital photo, inventory number, id car of object; a proper space for the object regarding material, size, weight, condition, that the space is clearly labeled, object located, properly stored, easy to find, easy to handle; a proper documentation-registrarabout an object that keeps and tacks all changes regarding shape, condition, moving, loaning, exhibiting, conservation; a proper measures for risk management and emergency situations, preventive conservation, transport, packing, handling and mounting of the collection; policies for exhibiting, presenting and communicating the collection and its sustainable use.

It is also necessary to keep the track about collection policies, management, results and outcomes and to evaluate and analyze situation in order to constantly maintain and improve optimal conditions for requisite state for collections.

Prilog B

Appendix B

Izveštaj o radu

Elena Vasić Petrović

Fondacija arhitekta Aleksandar Radović iz Niša, organizovala je letnju školu konzervacije-"Kamen", koja je realizovana u periodu od 2. do 11. avgusta 2019.godine u Muzeju Ponišavlja u Pirotu.

Učesnici letnje škole bili su iz Srbije, Irana i Egipta, njih osmoro ukupno. Program letnje škole je bio veoma bogat, pa je tako boravak u Pirotu započet obilaskom Pirotske tvrđave i drugih znamenitosti ovog mesta, a zatim se nastavio predavanjima u Kući Hristića, koja su obuhvatila brojne stručne teme. Predavači su takođe bili u međunarodnom sastavu (Bugarska i Srbija).

Glavna zamisao letnje škole bila je da se pomogne domaćinu, Muzeju Ponišavlja, u obradi zbirke kamenih spomenika, koji se nalaze u dvorištu Kuće Hristića. S druge strane, učesnici su dobili retku priliku da, u teoriji i praksi, uče o konzervaciji kamena, upravljanju zbirkama, istraživanju i prezentaciji nasleđa.

Praktični rad obuhvatio je snimanje i dokumentovanje petnaestak kamenih predmeta. Nakon toga, učesnici su podeljeni u dve grupe i odabrali su predmete na kojima će dalje raditi. Obe grupe su izradile detaljnu tehničku dokumentaciju za svoj predmet, kao i konzervatorske kartone sa opisima stanja, definisanjem i mapiranjem oštećenja, predlogom mera za konzervaciju, čuvanje i održavanje.

Nakon izvršene konzervacije i restauracije predmeti su smešteni u depo muzeja.

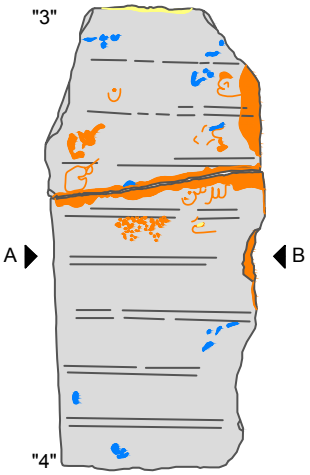
Tokom nedelje, organizovan je i izlet do Poganovskog i Sukovskog manastira i Zvonačke Banje.

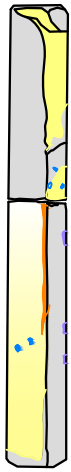
Pored Fondacije, letnju školu su finansijski podržali i Grad Pirot i "Jantar grupa" iz Beograda, dok su stručnu i logističku podršku pružili Muzej Ponišavlja i "DE arhitektura" iz Niša.

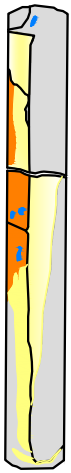
Poslednjeg dana svi učesnici su predstavili svoj rad, iskustva i utiske preko prezentacija koje su pripremili, a dobili su i sertifikate o učešću.

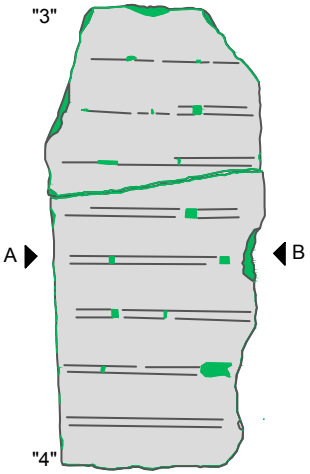
Koristim priliku, da se na kraju, zahvalim u ime Fondacije svima koji su pomogli da se ovaj program realizuje.

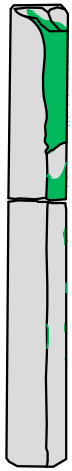
FRONT	SIDE "A"	SIDE "B"

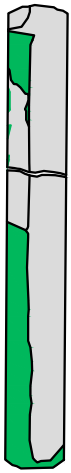












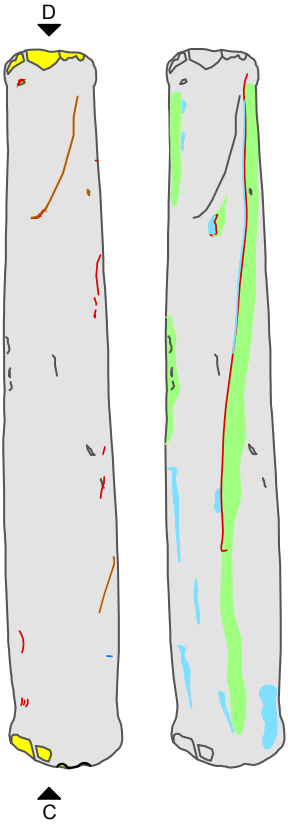
LEGEND OF DECAY

- CHANGE OF COLOR (maybe biological)
- SUPERFICIAL DEPOSITE (DUST)
- CALCINATIONS
- SCALLING
- MISSING PART

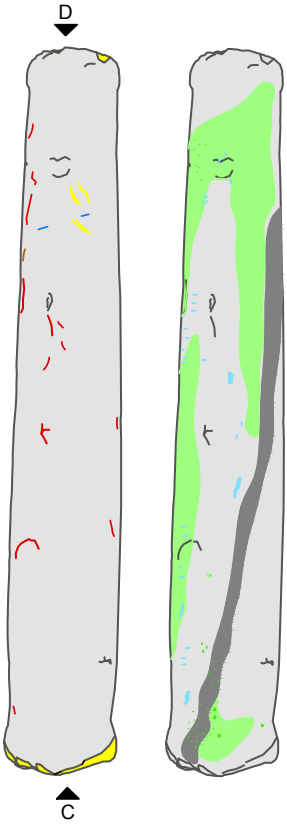
MUSEUM OF PONIŠAVLJE
PIROT, SERBIA

FRAGMENTED MONUMENT (2pcs)3&4 (GRAVE OF TOMB STONE)	FRONT SIDE"A" SIDE "B"
PARTICIPANS:	MEHDI PIRHAYATI MILICA ILIĆ KRISTINA ĐOKIĆ ALEKSANDRA GOCIĆ
DATE:	06.08.2019.

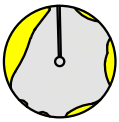
SIDE "A"



SIDE "B"



SIDE "C"



SIDE "D"

LEGEND OF DECAY

- CRACK
- MISSING PARTS
- DIFFERENT MATERIAL
- COLOURATION / COLOR FROM ANOTHER MONUMENT
- BIOLOGICAL DEGRADATION
- MECHANICAL DAMAGE
- STAINS

MUSEUM OF PONIŠAVLJE
PIROT, SERBIA

COLUMN, MARBLE, ROMAN	SIDE "A" SIDE "B" SIDE "C" SIDE "D"
PARTICIPANS:	MILICA SURLA MILICA RADOVIĆ CHEROUK FARAHAT
DATE:	06.08.2019.

Work Report

Elena Vasić Petrović

Architect Aleksandar Radovic Foundation from Niš, organised the Conservation Summer School - "Stone", which took place from August 2 to August 11, 2019 at the Museum of Ponisavlje in Pirot.

Participants of the summer school were from Serbia, Iran and Egypt, eight in total. The summer school program was very rich. Their stay in Pirot began with a tour of the Pirot Fortress and other sights of the town, and then continued with lectures at the Hristić House, which covered a number of professional topics. The lecturers were also international (Bulgaria and Serbia).

The main idea of the summer school was to assist the host, the Museum of Ponišavlje, in processing the collection of stone monuments located in the courtyard of the Hristić House. On the other hand, participants were given a rare opportunity to learn in theory and practice about stone conservation, collection management, research and heritage presentation.

The practical work involved recording and documenting fifteen stone objects. Subsequently, participants were divided into two groups and selected subjects to work on further. Both groups produced detailed technical documentation for their subject matter, as well as conservation charts describing the condition, defining and mapping the damage, proposing conservation, preservation and maintenance measures.

After conservation and restoration, the items were placed in a museum depot.

During the week, a trip to the Monasteries of Poganovo and Sukovo and to Zvonačka Banja was organized.

In addition to the Foundation, the summer school was financially supported by the City of Pirot and the "Jantar Group" from Belgrade, while expert and logistical support was provided by the Museum of Pinišavlje and "DE arhitektura" from Niš.

On the last day, all participants presented their work, experiences and impressions through the presentations they prepared, and received certificates of participation.

I would like to take this opportunity to, on behalf of the Foundation, thank everyone who helped us realise this program and make it possible.

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