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PRILOG PROUČAVANJU TEHNIKA I STRUKTURA
GRADNJE RIMSKIH VILA RUSTIKA NA OBALI RIMSKE
PROVINCIIJE DALMACIJE

A CONTRIBUTION TO THE STUDY OF BUILDING
TECHNIQUES AND STRUCTURES AT ROMAN VILLAE
RUSTICAE ON THE COAST OF THE ROMAN PROVINCE
OF DALMATIA

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Na obali provincije Dalmacije registrirano je oko 205 lokaliteta rimskih vila rustika, ali zbog slabe istraženosti nije posvećena posebna pažnja njihovoj međusobnoj zavisnosti. Najranija izgradnja vila rustika na istočnoj jadranskoj obali datirana je u period ranijeg Carstva, odnosno u 1. stoljeće poslije Krista. Na lokalitetima koji se pripisuju rimskim vilama rustikama evidentirane su sljedeće tehnike gradnje: opus spicatum, opus isodomum, opus pseudoisodomum, opus caementicium, opus incertum, opus reticulatum, opus tessellatum, opus vermiculatum, opus sectile i opus signinum. Na osnovi sadržaja u postojećoj literaturi navedeni su lokaliteti s arheološkim ostacima gdje su zastupljene pojedine tehnike gradnje. Tehnika mozaika (opus musivum) korištena je za dekoraciju arhitektonskih površina podova, zidova i svodova. Ta više slikarska tehnika postizala se postavljanjem malih višebojnih kockica od kamena, keramike ili stakla na cementnu bazu. Postojale su dvije različite tehnike izrade: opus tessellatum i opus vermiculatum. Dolaskom Rimljana na istočnu jadransku obalu dogodile su se revolucionarne promjene u građevinarstvu. Započela je gradnja lokalnim materijalima, ali spomenutim tehnikama koje nisu bile poznate autohtonom stanovništvu. Upotreba maltera jedna je od najvažnijih novina koju je donio antički svijet. On je bio osnova svim građevnim strukturama, a sam je tvorio

There are 205 registered sites of Roman villae rusticae on the shores of the province of Dalmatia, but no particular attention was dedicated to their mutual ties due to insufficient research. The earliest construction of villae rusticae on the eastern Adriatic coast dates back to the early Imperial period in the first century AD. The following building techniques have been registered at Roman villa rustica sites: opus spicatum, opus isodomum, opus pseudoisodomum, opus caementicium, opus incertum, opus reticulatum, opus tessellatum, opus vermiculatum, opus sectile, and opus signinum. Sites containing archeological remains representing these different building techniques are examined based on the existing literature. The mosaic technique (opus musivum) was used to decorate the surfaces of floors, walls and vaults. This technique, similar to painting, is accomplished by setting multi-colored small stone tiles, glazed ceramic or glass on a mortar base. There are two different mosaic techniques, opus tessellatum and opus vermiculatum. Revolutionary changes in civil engineering occurred with the arrival of the Romans to the eastern Adriatic coast. Construction with local materials commenced, but employing techniques not previously known to the indigenous population. The use of mortar is one of the most important innovations brought by the civilization of Classical Antiquity. It was the foundation

temeljnu građu samosvojne strukture nazvane *opus caementicium* (cementum – sječeni kamen, zidarski kamen). Malter se sastojao od pijeska i vapna u pogodnom omjeru pomješanih s većom ili manjom šljakom. U suvremenom proučavanju arheoloških lokaliteta trebalo bi više pažnje posvetiti tehnikama gradnje kao i vrstama i podrijetlu materijala korištenim pri gradnji određenog objekta.

Cljučne riječi: provincija Dalmacija, vila rustika, opus spicatum, opus isodomum, opus pseudoisodomum, opus caementicium, opus incertum, opus musivum, opus teselatum, opus vermiculatum, opus sectile, opus signinum

Na obali provincije Dalmacije i pripadajućim otocima registrirano je oko 210 lokaliteta rimskih vila rustika (Kilić-Matić 2002). U ovom ćemo radu predstaviti tehnike izgradnje vila rustika i spomenuti novu vrstu građevinskoga materijala u rimskoj provinciji Dalmaciji. Razmatranje se temelji na sadržajima iz postojeće literature i poznatim arheološkim ostacima te na proučavanju lokacija gdje su zastupljene pojedine tehnike. Problem je u tome što istraživači pojedinih lokaliteta rimskih vila nisu uvijek evidentirali tehnike izgradnje pa ćemo navesti samo one lokalitete gdje se te tehnike spominju. Osvrnut ćemo se i na tehnike izrade mozaika te na njihove ostatke nađene u rimskim vilama rustikama.

OPUS SPICATUM

Najčešće evidentirana tehnika gradnje je *opus spicatum* (*pavimentum testeceum*).

Opus spicatum (*opera a spiga*) tehnika je u kojoj se od malih četvrtastih opeka formiraju likovi u obliku klasa ili riblje kosti. Korištena je za prekrivanje podova otkrivenih terasa, dvorišta i skladišta za hranu (Lugli 1957: 49). Kod nas je najviše primjenjivana za gradnju podova bazena, cisterna i piscina (Suić 1976: 108, 111).

Na sjeveroistočnoj strani privlačkog poluotoka kod Zadra, u vinogradu na predjelu Sabunike, nalazi se plitka gomila koju stanovništvo naziva Kopana gomila. Na njezinoj su površini vidljivi dijelovi zidova obloženi debelim slojem žbuke s komadićima opeke u strukturi. Pokraj njih nalazi se bazen čija unutrašnja strana u dnu ima podnicu od malih opeka zidanih tehnikom *opus spicatum*. U kutu bazena podnica je na manjem kvadratnom prostoru bila napravljena od drugačije postavljenih opeka i na nešto je nižem nivou od ostatka poda (Brusić 1973: 419).

U blizini, u ogradi puta što od zaselka Mletak vodi u uvalu Bilotinja, vide se ostaci uništene zgrade. Osim ostataka kamene mase i žbuke ima i većih gromada poda bazena izgrađenog od opeke tehnikom *opus spicatum*. Zgrada se nalazila u susjednom vinogradu.

of all buildings and it was the basic substance of structures called *opus caementicium* (cementum – cut stone). Mortar consisted of sand and lime in an appropriate ratio mixed with larger or smaller gravel. Modern research into archaeological sites should draw more attention to building techniques and to the types and origins of materials used to construct specific structures.

Key words: Province of Dalmatia, villa rustica, opus spicatum, opus isodomum, opus pseudoisodomum, opus caementicium, opus incertum, opus musivum, opus teselatum, opus vermiculatum, opus sectile, opus signinum

There are approximately 210 registered sites of large Roman country estates, or *villae rusticae* (Kilić-Matić 2002) on the coast of the Roman Province of Dalmatia and the adjacent islands. This work will present the techniques employed to construct these *villae rusticae* and note a new type of construction material used in the Province of Dalmatia. This study is based on existing literature and recognized archeological remains, and on an examination of the sites where individual techniques are present. The problem is that researchers at individual *villae rusticae* sites did not always record the construction techniques, so here we shall only refer to those sites where techniques are mentioned. Techniques for making mosaics and their remains found in Roman *villae rusticae* will also be mentioned.

OPUS SPICATUM

The most frequently recorded building technique is *opus spicatum* (*pavimentum testeceum*). *Opus spicatum* (*opera a spiga*) is a technique in which small rectangular bricks are placed in the form of spikes or fish bones. The technique was used to cover the floors of outdoor terraces, yards and larders (Lugli 1957: 49). In Croatia it was mostly applied to construct the bottoms of pools, cisterns and piscines (Suić 1976: 108, 111).

On the northeastern side of Privlaka Peninsula near Zadar, in a vineyard in an area called Sabunika, there is a shallow mound which the local residents call Kopana gomila. Sections of walls with a thick layer of plaster and inserted pieces of brick are visible on its surface. Next to them there is a pool, in which the bottom interior side has a floor made of small bricks laid in the *opus spicatum* style. A corner of the pool's floor has a smaller square space made of bricks laid in a different style, and it lies at a slightly lower level than the rest of the floor (Brusić 1973: 419).

The remains of a devastated building can be seen nearby, in the stone fence along the path from the hamlet of Mletak leading to Bilotinja Cove. Besides the remains of stone and mortar, there are also



Slika 1. *Opus spicatum* (Suić 1976: 108).

Figure 1. *Opus spicatum* (Suić 1976: 108).

Sjeverozapadno od Zadra u sredini poluotoka Oštri rat (Puntamika) nalaze se ostaci srednjovjekovne starohrvatske Crkve sv. Stošije. Teren oko te crkvice istraživali su M. Suić i I. Petricioli 1952. uz privremenu tehničku suradnju A. Faber (Suić & Petricioli 1955: 9). Ustanovili su da je sakralna građevina nastala u širem antičkom sklopu vile rustike, i to nad njenom cisternom i u njoj samoj. U vili su istraženi ostaci jedne prizemne prostorije, male piscine s mozaičnim podom i cisterne koja je nadsvođena i djelomično ukopana s podom od opeka strukturiranih tehnikom *opus spicatum*.

Desetak kilometara istočno od Zadra, na istaknutoj uzvisini koja dominira ravničarskim obalnim prostorom, nalazi se selo Dračevac Zadarski (Fadić 1989: 118). Prilikom nivelacije terena za izgradnju seoskoga groblja, na položaju zvanom Stara Pudarica u jugoistočnom dijelu sela, otkriveni su nalazi iz antičkoga razdoblja (mozaici, tegule, fragmenti arhitekture itd.). Što se tiče ostataka arhitekture, na pojedinim su mjestima sačuvane crno-bijele mozaičke kockice, podne opeke manjih dimenzija spojene tehnikom *opus spicatum* te profilirani kameni ulomci arhitekture. Brojne krovne opeke (*tegulae*) sa žigom SOLONAS i PANSIANA upućuju na to da je ovaj sklop morao nastati u 1. stoljeću poslije Krista.

larger fragments of a pool floor made of tiles in the *opus spicatum* style. The building was located in the neighboring vineyard.

The remains of the medieval old Croatian Church of St. Anastasia are located northwest of Zadar, in the middle of the peninsula known as Oštri rat (Puntamika). The terrain around the church was explored by M. Suić and I. Petricioli in 1952, with occasional technical assistance from A. Faber (Suić & Petricioli 1955: 9). They ascertained that this sacral structure was built in a broader Roman *villa rustica* complex, just above and within its cistern. The remains of an underground room, a small pool with a mosaic bottom and a cistern that is overarched and partially buried with a tile floor exhibiting the *opus spicatum* structural technique were researched in the villa.

The village of Dračevac Zadarski (Fadić 1989: 118) is located approximately ten kilometers east of Zadar, on a notable rise that dominates this flat coastal area. When the terrain was leveled to construct the village cemetery at the site called Stara Pudarica in the village's southeastern section, Roman finds were uncovered (mosaics, tegulae, architecture fragments, etc.). As for architectural remains, black-and-white mosaic tiles, smaller floor tiles connected in *opus spicatum* style and formed stone fragments of architecture have been preserved at places. Numerous roof tiles (*tegulae*) bearing the seal SOLONAS and PANSIANA indicate that this complex must have emerged in the first century AD.

The walls and other remains of a *villa rustica* are located right on the seashore in the Sveti Luka Cove east of Jelsa on the island of Hvar. That portion of a wall that is now a part of fence wall on the eastern side of the cove is of high quality. It is made of thin stone tiles with remains of hydraulic mortar and was probably one of the walls to a basin used to store oil. It seems that under this wall, in the sections of submerged stones one can discern the remains of a small jetty, which was probably built for this villa. A half-century ago, the remains of an ancient mill, inscriptions and tiles with seals were found here. Part of an ancient floor made of small tiles assembled like grain husks (*opus spicatum*) has been preserved in a nearby field cottage.

The remains of the Church of St. Barbara are located on the islet of Sutvara in the Pelješac Channel between Majsan and Korčula. Part of a wall made of bricks laid in *opus spicatum* style are visible here (Fisković 1953: 232).

The remains of a building were found in the garden of the teacher Marko S. Vekarić in Orebić in 1939 (Fisković 1953: 223). The remains were found at the southeastern side of his house, which had first be-

U uvali Sv. Luke istočno od Jelse na otoku Hvaru pri samome se moru nalaze zidovi i ostaci vile rustike. Kvalitetan je onaj zid koji je sada dio ogradnih zidova na istočnoj strani uvale. Načinjen je od tankih kamenih pločica s ostacima hidraulične žbuke i vjerojatno je bio jedan od zidova bazena za ulje. Čini se da se ispod ovoga zida u rasporedu kamena pod vodom mogu nazrijeti ostaci jednoga maloga gata koji je vjerojatno izgrađen za ovu vilu. Prije pola stoljeća ovdje su nađeni ostaci antičkog mlina, natpisi i opeke sa žigovima. U blizini, u poljskoj kućici, sačuvan je dio antičkog poda načinjen od sitnih opeka složenih poput žitnog klasja (*opus spicatum*).

Na otočiću Sutvari u Pelješkom se kanalu između Majsana i Korčule nalaze ostaci Crkve sv. Barbare. Vidljivi dio zida građen je od opeke tehnikom *opus spicatum* (Fisković 1953: 232).

U perivoju učitelja Marka S. Vekarića u Orebiću pronađeni su 1939. ostaci jedne građevine (Fisković 1953: 223). Ostaci su nađeni na jugoistočnoj strani njegove kuće koja je najprije pripadala obitelji Ljubak, a zatim obitelji Šunj. Nalaze se na dubini od oko dva metra na mjestu koje je od istočnoga vrtnog zida udaljeno šest metara, a od južnoga zida skladišta četiri metra. Otkopano dno s rubovima porušених zidova cisterne četvrtasta oblika prekriveno je debelim slojem žbuke u kojoj je vapno izmiješano s pijeskom i komadićima opeke. Ispod žbuke na većoj je dubini nađena okrugla kamenica koja je, obložena žbukom, oblikovala udubinu. Još niže otkriveno je drugo dno, odnosno pod od malih opeka debelih 1,09 cm, dugih 0,1 cm i visokih 0,65 cm. Opeke su okomito postavljene i poredane jedna do druge u obliku riblje kosti (*opus spicatum*). Radi se o dnu antičke cisterne naknadno izgrađene iznad poda ranije rimske građevine.

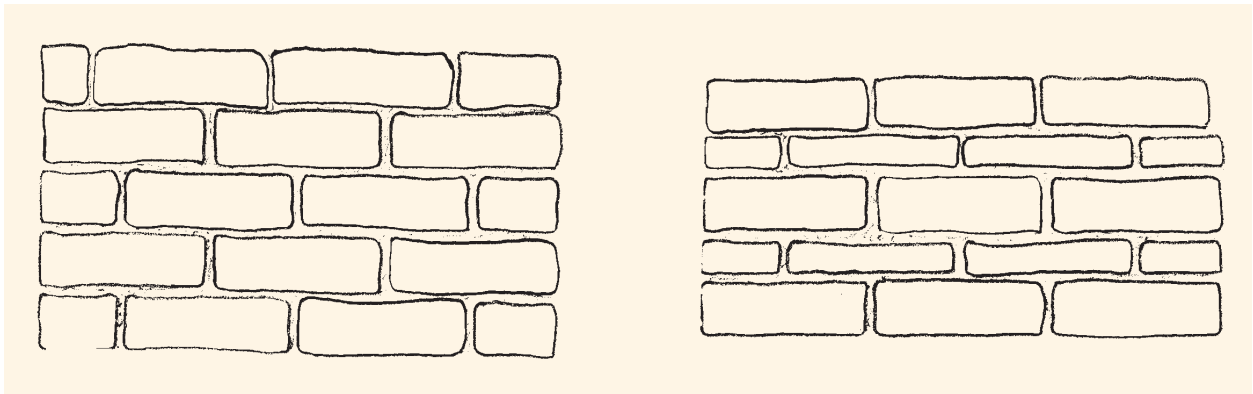
OPUS ISODOMUM

Sljedeća je česta tehnika gradnje *opus isodomum*. Ovom se tehnikom zid gradi od kamenih blokova jednake visine. M. Suić opisuje je kao pravilnu tehniku sa strogom tendencijom uslojavanja i brižnom obradom kamenih blokova, uglavnom korištenu za javne građevine. Vitruvije (Vitruvije 1999: 42) tumači da je ovaj način gradnje grčki način zidanja. Kaže da se u toj tehnici za povezivanje mekog lomljenog kamena ne koristi žbuka, nego se polažu slojevi od bazaltnog ili tvrdog kamena čije se sljubnice vežu naizmjeničnim slojevima kao kod zidanja opekama. Tako se dobivaju trajna i čvrsta svojstva zida. Dva su načina zidanja: jedan se naziva *isodomum*, a drugi *pseudoisodomum*. *Isodomum* je oblik u kojem se svi slojevi kamena zidaju u je-

longed to the Ljubak family, and then the Šunj family. They are located in a roughly two-meter depression six meters from the eastern garden wall, and four meters from the southern wall of the storage shed. The excavated bottom, together with the edges of the rectangular cistern, is covered by a thick layer of plaster in which the limestone is mixed with sand and pieces of brick. Under the plaster, at a greater depth, a round stone was found which, covered with plaster, formed a recess. Another bottom was uncovered even deeper, actually a floor of small thick tiles, 1.09 cm thick, 0.1 cm wide and 0.65 cm long. The tiles are laid horizontally and placed next to one another in the form of fish bones (*opus spicatum*). This is the bottom of an ancient cistern subsequently built over the floor of an earlier Roman structure.

OPUS ISODOMUM

The next most frequent building technique is *opus isodomum*. Using this technique, a wall is built of stone blocks of equal height. M. Suić describes it as a balanced technique with a strict layering tendency and carefully worked stone blocks, generally used for public buildings. Vitruvius (Vitruvije 1999: 42) interprets this method as a Greek masonry style. Allegedly this technique does not involve mortar to connect soft cut stone, rather layers of basalt or hard rock are used, and they are bonded in alternating layers like in brick-laying. Thus permanent and firm wall properties are achieved. There are two masonry styles: one is called *isodomum*, and the other *pseudoisodomum*. *Isodomum* is a form in which all stone layers are laid at an equal height, while *pseudoisodomum* is a form in which the layers are unequal and different. Vitruvius believes that one and the other method are firm because the stone in both is solid and dense so it does not absorb liquid from the mortar, which therefore stays moist for a long time. The horizontally placed stones prevent the mortar from falling. Remains of Roman architecture were discovered along a road that passes through Kostrena on the estate of Vinko Miloš in 1934. Archaeological excavations were conducted by the director of the Sušak Town Museum, Ivan Sveško. Two outer walls were found, one vertically placed on the other, as well as three parallel internal walls with foundations in the ground. The walls along the roadside are 11 m long, while the vertical walls extend toward the sea in a length of 21.2 m. They are made of finely-cut stone in the *opus isodomum* style. The height of the walls reaches 2.5 m. Among the movable artifacts are numerous amphora fragments and coins of Constantine II (337-340) minted in Antioch (Matejčić 1982



Slika 2. *Opus isodomum* i *opus pseudoisodomum* (Vitruvije 1999: 43).

Figure 2. *Opus isodomum* and *opus pseudoisodomum* (Vitruvije 1999: 43).

dnakoj visini, a *pseudoisodomum* oblik u kojem su slojevi nejednaki i različiti. Vitruvije smatra da su i jedan i drugi način čvrsti jer samo kamenje ima gusta i čvrsta svojstva pa ne može upijati tekućinu iz žbuke koja dugo ostaje vlažna. Vodoravno položeno kamenje sprečava ispadanje žbuke.

Uz cestu koja prolazi Kostrenom na imanju Vinka Miloša otkriveni su 1934. ostaci antičke arhitekture. Arheološka istraživanja provodio je direktor sušačkog Gradskog muzeja Ivan Sveško. Pronađena su dva vanjska zida, jedan okomito položen na drugi, te tri unutrašnja paralelna zida čiji su temelji na zemlji. Zidovi uz cestu dugi su 11 m, a oni okomiti protežu se prema moru u dužini od 21,2 m. Izgrađeni su od dobro obrađena kamenja tehnikom *opus isodomum*. Visina zidova doseže 2,5 m. Od pokretnog arheološkog materijala pronadeno je više fragmenata amfora i novac Konstantina II. (337–340) kovan u Antiohiji (Matejčić 1982: 26, 27). Radi se o sklopu vile rustike s većim prostorijama čije širine iznose 4,6 m, 3,3 m, 6 m i 3,9 m. Nalaz još nije revidiran ni detaljno istražen.

Uska i plitka prevlaka Mala Proversa sa sjeverozapadne strane zatvara krajnji rt Dugog otoka, a s jugoistočne strane otočić Katinu smješten između Dugog otoka i Kornata. Jednim svojim krakom štiti prostranu uvalu Telašćicu na Dugom otoku. Na sjeveroistočnoj strani s Dugim otokom zatvara uski morski tjesnac, Malu Proversu, široku oko 40 m, a duboku jedva metar i pol. Posred tjesnaca iskopan je uski prolaz za manje brodove.

Najveći i najbolje sačuvan objekt je cisterna na krajnjem dijelu Dugog otoka podno brda Mrkotina. U odnosu na ostale dijelove znatno je povišena: pod

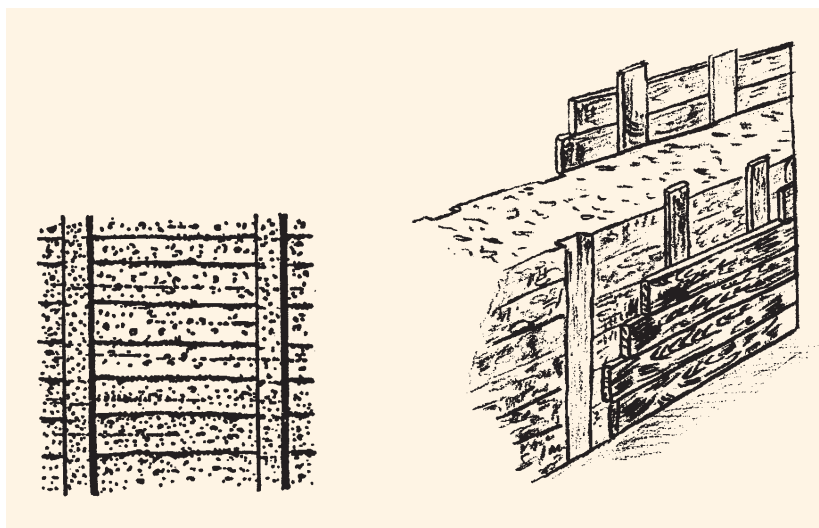
:26, 27). This is a *villa rustica* complex with larger rooms, 4.6 m, 3.3 m, 6 m and 3.9 m wide. This find has not yet been evaluated nor researched in detail.

The narrow and shallow isthmus of Mala Proversa in the northwest closes the extreme cape of the island of Dugi, while the islet of Katina is located in the southeast between Dugi and the Kornati islands. One of its arms shields the spacious Telašćica Cove on Dugi. Together with the island of Dugi in the northeast, it closes a narrow strait, Mala Proversa, approximately 40 m wide, where the water is barely a meter and a half deep. A narrow canal was dug in the middle of the strait so small boats can pass.

The largest and best-preserved object is a cistern at the far end of Dugi under Mrkotina Hill. In relation to other finds, it is considerably higher: its floor is approximately a meter and a half above sea level. It is nicely constructed and evenly layered (*opus isodomum*), made of domestic limestone and bonded with quality mortar. It is shaped like a regular parallelogram, a little longer than 18 m, approximately 11 m wide, and oriented laterally from northeast to southwest. The width of the perimeter walls is approximately 88–90 cm. The walls are externally supported with buttresses connected to the walls themselves. Their width is the same as that of the walls (approximately 90 cm) and they all protrude equally (approximately 70 cm), except the first counterfort (I) in the extension of wall C which is somewhat longer (76 cm) and narrower (60 cm) than the other walls. The external walls and buttresses are quite well preserved up to a height of approximately 2 m above the foundations; only parts of wall D and wall III have sustained greater damage. The walls

Slika 3.
Opus caementicium
(Suić 1976: 108; Lugli 1957: 386).

Figure 3.
Opus caementicium
(Suić 1976: 108; Lugli 1957: 386).



joj se nalazi oko metar i pol iznad morske površine. Građena je od lijepo i pravilno uslojena (*opus isodommum*) domaćeg vapnenca i vezana dobrom žbukom. Ima oblik pravilne pačetvorine, dugačke malo više od 18 m, a široke oko 11 m, orijentirane po dužini u pravcu sjeveroistok – jugozapad. Debljina perimetralnih zidova iznosi oko 88–90 cm. S vanjske su strane zidovi poduprti potpornjacima, organski vezanima sa samim zidovima. Njihova debljina ista je kao i debljina zidova (oko 90 cm) i svi su podjednako istureni (oko 70 cm), osim prvog kontrafora (I) u produženju zida C koji je nešto duži (76 cm) i uži (60 cm) od ostalih zidova. Vanjski zidovi i potpornjaci dosta su dobro sačuvani do visine od oko 2 m iznad temelja; znatnije je oštećen samo dio zida D i zida III. Većim dijelom zidovi leže na kamenu živcu koji je ponegdje lomljen da bi se dobila potrebna dubina. Ta je cisterna (A, B, D, C) bila slobodna samo sa sjeverozapadne i sjeveroistočne strane, uza zidove C i D te djelomično uza zid A (Suić & Petriciulli 1952: 177).

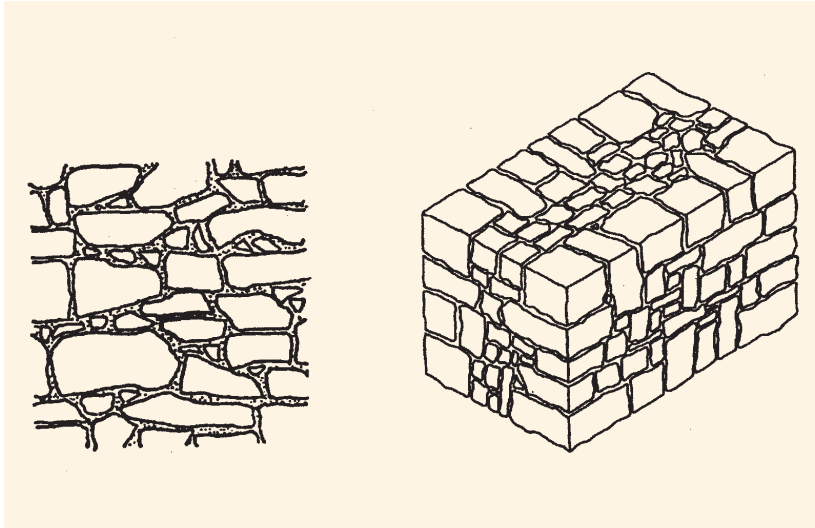
OPUS CAEMENTICIUM

Opus caementicium (structura caementitia) predstavlja tehniku kojom se gradio zid od žbuke pomiješane s komadima neobrađena kamena. M. Suić opisuje ovu tehniku kao zidanje smjesom žbuke i šljake u formama od dasaka pričvršćenih na uspravne grede – šalung (Suić 1976: 109). To je cementna struktura na čijoj se vanjskoj strani vide otisci sitnijega amorfnog kamena. G. Lugli (1957: 48) smatra da je *opus caementicium (opera a sacco)* konstrui-

largely lie on a vein of solid rock, which was broken in places to attain the necessary depth. This cistern (A, B, D, C) was free only from the northwest and northeast, next to walls C and D and partially next to wall A (Suić & Petriciulli 1952: 177).

OPUS CAEMENTICIUM

Opus caementicium (structura caementitia) is a technique used to build walls from mortar mixed with pieces of uncut stone. M. Suić describes this technique as building walls with a mixture of mortar and gravel into molds of boards secured on upright posts – molding (Suić 1976: 109). This is a cement structure, on which impressions of smaller amorphous stone are visible on the external side. G. Lugli (1957: 48) believes that *opus caementicium (opera a sacco)* consists of a mixture of mortar and small pieces of stone. On the island of Ugljan the remains of walls can be seen at Kvitovo, Šljakin and on a hill southwest of Crikva. The local residents also found other traces: a small bronze appliqué shaped like a mask, two walled graves, a burrowed mound containing two walls with a room between built in the *opus caementicium* style and six thresholds that are 130 cm long without inscriptions or any other work. Mosaic remains are visible on Kvintova Meadow and on a mound east of Crikva. There are many varying fragments of vessels, Roman glass, and smaller and larger roof-tile fragments in the entire surrounding space (roughly 100 cm x 130 cm). Among them are ten fragments with various seals from the Pansiana factory.



Slika 4.
Opus incertum
(Suić 1976: 108; Vitruvije 1999: 43).

Figure 4.
Opus incertum
(Suić 1976: 108; Vitruvije 1999: 43).

ran od mješavine žbuke i malih komadića kamena.

Na otoku Ugljanu vide se ostaci zidova na Kvitovu, Šljakinu i na brijegu jugozapadno od Crikve. Stanovnici su nailazili i na druge tragove: malu brončanu apliku u obliku maske, dva uzidana groba, prokopanu gomilu u kojoj su dva zida s međuprostorom izgrađenim tehnikom *opus caementicuma* te šest pragova dugih 130 cm bez natpisa i obrade. Na Kvintovoj njivi i na gomili istočno od Crikve vide se ostaci mozaika. Na čitavom okolnom prostoru (otprilike 100 cm x 130 cm) postoji mnoštvo raznovrsnih fragmenata posuđa, rimskog stakla, manjih i većih komada krovnih opeka. Među njima je i devet komada s različitim žigovima tvornice PANSIANA.

OPUS INCERTUM

Tehnikom *opus incertum* (*opera incerta*) građen je zid čija je jezgra cijela od cementa, a vanjska strana od mnogostrano rezanih blokova (Lugli 1957: 48). Zid je građen od kamena lomljenca vezanog žbukom. Ova tehnika gradnje česta je u rustičnim građevinama i nema tendenciju vodoravnog uslojavanja. Njezin nastanak datira s prijelaza 3. u 2. stoljeće prije Krista. Zid se ne diže pomoću kalupa od dasaka (šalung), nego nizanjem redova kamenja na oba njegova lica, a razmak između njih ispunjava se malterom i škaljom. Pravilnost okomitog podizanja zida omogućuje upotreba viska – *perpenendiculum* (Suić 1976: 109).

Ovu vrstu zidanja Vitruvije smatra zastarjelom i nepravilnom (*incertum*), jer u njegovo vrijeme svi ko-

OPUS INCERTUM

The *opus incertum* (*opera incerta*) technique was used to build walls in which the center is made entirely of cement, while the external sides of multiply cut blocks (Lugli 1957: 48). The wall is made of broken stone bonded by mortar. This construction technique is frequent in rustic buildings, and there are no horizontal layering tendencies. It emerged at the turn of the third into the second century BC. The wall is not raised using molds made of boards, rather by setting up rows of stones on both faces, while the spaces between them are filled with mortar and stone fragments. The walls remain straight while being raised by using plumb-lines – *perpendicularum* (Suić 1976: 109).

Vitruvius considers this type of construction obsolete and irregular (*incertum*), because in his time everybody used reticular (*reticulatum*) building techniques. Irregular raising of walls implies the use of broken stones that rest on one another and interlock. Vitruvius did not consider this type of construction attractive, but it is firmer than reticular. Both types require the use of smaller stones so that the walls retain a considerable amount of limestone and sand and thereby last longer (Vitruvije 1999: 41, 42).

There are Roman remains, partially submerged under the sea's surface, that can be considered a Roman *villa rustica* at Vela Luka on the island of Korčula, in Kala Cove right next to the western side of the Church of the Immaculate Conception of the Blessed Virgin Mary. Fragments of coarse Roman pottery and parts of a wall built in *opus incertum* style are

riste tehniku mrežastog (*reticulatum*) zidanja. Nepravilno zidanje podrazumijeva uporabu lomljenog kamena koje sjedi jedno na drugome i međusobno se zahvaća. Za Vitruvija takvo zidanje nije lijepo, ali je čvršće od mrežastoga. Za obje vrste zidanja treba koristiti sitnije kamenje da bi zidovi dobili dosta vapna i pijeska te tako duže trajali (Vitruvije 1999: 41, 42).

U Veloj Luci na otoku Korčuli u uvali Kale neposredno sa zapadne strane Crkve bezgrješnog začeća Blažene Djevice Marije, a dijelom i ispod morske površine, nalaze se antički ostaci koji bi se mogli smatrati rimskom vilom rustikom. Uokolo su vidljivi ulomci grube antičke keramike i dio zida građen tehnikom *opus incertum*. Lokalitet je uglavnom uništen prilikom gradnje okolnih cesta.

Od studenoga 1999. do veljače 2000. trajala su zaštitna arheološka istraživanja u Primatovcima, i to nedaleko od glavne prometnice koja vodi u pravcu Bribirskih Mostina, uz lokalnu cestu, na padini brežuljka Gajčina, nedaleko od bunara Šakić (prirodni izvor) te na položaju Vrilo, na sredini primatovačkoga polja. Na položaju Gajčine otkopano je nekoliko prostorija koje najvjerojatnije pripadaju rimskoj vili rustici, a među njima su najbolje očuvani ostaci tješka s bazenom za vino ili ulje. Bazen ima dimenzije 2,2 m x 1,74 m x 1,04 m. Zidovi su mu ožbukani debelim slojem hidraulične žbuke (debljine 3 cm), a pod je izrađen od kvalitetnih keramičkih pločica (8 cm x 12 cm) poredanih mozaičnom tehnikom. Na sredini poda koji se strmo spušta prema središtu nalazi se kameni lijevak. U njemu se skupljao talog pa se pretpostavlja da je služio za ulje. Nešto niže od ove prostorije nalazi se jedna manja čija su tri zida udvostručena, a s jugozapadne je strane litica. Pod je također od litice pa voditelj istraživanja I. Pedišić pretpostavlja da je prostorija služila kao ostava za hranu. Uz te prostorije pronađene su još dvije. Jedna od njih ima dobro očuvan pod od okomito postavljenih keramičkih pločica poredanih tehnikom *opus spicatum*, a na sredini je uski kanalić, također od keramičkih pločica, širine 11 cm i dužine 2,4 m. Kanal je prolazio ispod zajedničkoga zida u prostor za pohranu vina ili ulja. Uz njega se uz pomoć triju stuba od kamenih ploča silazilo u drugu prostoriju bez poda (litica), koju Pedišić smatra ostavom za alat. Debljina svih zidova iznosi 0,65 m, a izrađeni su od kamena u žbuci tehnikom *opus incertum* (Pedišić 1999/2000: 521).

OPUS RETICULATUM

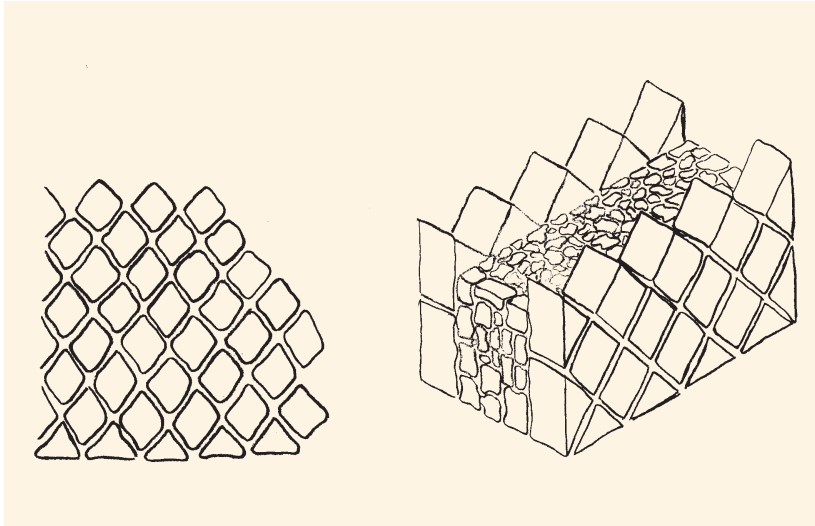
Za tehniku *opus reticulatum* u Likovnoj enciklopediji piše da je to zidna obloga od kockastoga kame-

visible in the vicinity. The site was generally devastated during construction of the surrounding roads. From November 1999 to February 2000 a rescue excavation was conducted in Primatovci, not far from the main road that leads toward Bribirska Mostina, along a local road on the slopes of Gajčina Hill not far from Šakić Spring (a natural source) and at Vrilo, in the middle of Primatovci Field. Several facilities were uncovered at the Gajčina site which most likely belonged to a Roman *villa rustica*, and among them the best preserved are the remains of a press and basin for wine or oil. The basin's dimensions are 2.2 m x 1.74 m x 1.04 m. The walls are coated with a thick layer of hydraulic mortar (3 cm thick), while the floor is made of high-quality ceramic tiles (8 cm x 12 cm) lined up in mosaic style. There is a stone funnel in the middle of the floor, which has a steep decline. A sediment has collected on it so it is assumed that it was used for oil. There is another smaller space a little lower than this one, where three walls are doubled and the southwestern side is a rock face. The floor is also part of the rock, so the research supervisor I. Pedišić assumed that this space was used to store food. Besides this room, two more were found. One of them has a very well-preserved floor made of vertically placed ceramic tiles arranged in *opus spicatum* style, while there is a narrow canal in the middle of the room, also made of ceramic tiles, 11 cm wide and 2.4 m long. The canal passed under a common wall into a space used to store wine or oil. Using it with the help of three ceramic-tile steps, one can enter another room without a floor (solid rock), which Pedišić believes was a storage room for tools. The thickness of all walls is 0.65 m, and they are made of stone in mortar in *opus incertum* style (Pedišić 1999/2000: 521).

OPUS RETICULATUM

According to the *Likovna enciklopedija* (Arts Encyclopedia), the *opus reticulatum* style constitutes a wall made of square stones or bricks set in the form of the holes in a net (ELU 1966: 597). M. Suić describes it as a construction technique using boarded molds which entails the use of small square blocks to cover the external side while the inside is filled with concrete. The core is still *opus caementicium*. Small pieces of stone, shaped like pyramids on which the base has the approximate form of a square, are set on the external face of the wall. This creates the impression of a net. This construction method assumed its final form in the final years of the Republic (Suić 1976: 109, 110).

In Croatia, this building technique has only been recorded in the fertile field of Lumbarda, on the



Slika 5.
Opus reticulatum
(Vitruvije 1999: 43).

Figure 5.
Opus reticulatum
(Vitruvije 1999: 43).

nja ili opeka poredanih u obliku oka na mreži (ELU 1966: 597). M. Suić je opisuje kao tehniku gradnje u formama od dasaka koja uključuje oblaganje manjim blokovima s vanjske strane i punjenje žbukom. Srž i dalje ostaje *opus caementicium*. Manji komadi kamenja, oblikovanih u obliku piramide kojoj je osnovica (baza) imala približan oblik kvadrata, postavljala se s vanjske strane zida. Tako bi se ostvario dojam mreže. Taj način zidanja svoj konačni oblik poprima u posljednjim godinama Republike (Suić 1976: 109, 110).

Kod nas je ova tehnika gradnje registrirana samo u plodnom polju Lumbarde, na istočnom dijelu otoka Korčule. Između uvala Pržina i Bili žal nalazi se Velo poje gdje je rimski veleposjednik sagradio prostranu vilu uz antičku prometnicu koja je prolazila sredinom polja. Polje je ravnica čija dužina u smjeru istok – zapad iznosi oko 2 km, a u smjeru sjever – jug od 200 do 800 m. Kako navodi čuvena lumbardska psefizma, polje je u vrijeme grčke kolonizacije bilo podijeljeno među 200 isejskih doseljenika. Za rimske je vladavine zasigurno bilo u posjedu jednog vlasnika koji je svojim imanjem upravljao iz prostrane građevine. Njezin tlocrt u vidljivome dijelu ima na krajevima dva četvrtasta objekta: dimenzije zapadnoga objekta su 25 m x 29 m, a istočnoga 24 m x 27 m. Povezuje ih dugački hodnik koji je vjerojatno bio trijem ili portik dug 93 m i širok 4,66 m. U zidu vile sačuvan je dio izgrađen tehnikom *opus reticulatum* od lijepih pravilnih kamenih kocaka visine 1,5 m – 1,8 m. To je jedinstven primjer ove tehnike gradnje na našoj obali.

eastern section of the island of Korčula. Velo poje ('Big Field') is located between Pržina Cove and Bili ('White') Beach. This is where a Roman landlord built a spacious villa next to a Roman road that passed through the middle of the field. The field is a flat plain with a length of 2 km from east to west, and 200 to 800 m long from north to south. As stated in the renowned Lumbarda psephism, during the Greek colonization the field was divided among 200 colonists from Issa. During Roman rule, it was certainly held by a single owner who administered his estate from a spacious building. Its floor-plan in the visible portion has two rectangular structures at each end: the dimensions of the western structure are 25 m x 29 m, while those of the eastern structure are 24 m x 27 m. They are connected by a long corridor which was probably a porch or patio, 93 m long and 4.66 m wide. A part of the villa's wall made from exquisitely even 1.5 m – 1.8 m stone cubes in *opus reticulatum* style has been preserved. This is a unique example of this technique on Croatia's coast.

OPUS MUSIVUM

The mosaic technique (*opus musivum*) served to decorate architectural surfaces such as floors, walls and arches. This generally artistic technique was conducted by assembling small differently-colored pieces of stone, glazed ceramic or glass on a mortar base. Two types of techniques are distinguished: *opus tessellatum* and *opus vermiculatum*. The *opus tessellatum* style consists of small rectangular or

OPUS MUSIVUM

Tehnika mozaika (*opus musivum*) služila je za ukrašavanje arhitektonskih površina podova, zidova i svodova. Ta, uglavnom slikarska, tehnika izvedena je slaganjem raznobojnih kockica od kamena, glazirane keramike ili stakla na malternu osnovu. Razlikuju se dvije vrste izrade: *opus tessellatum* i *opus vermiculatum*. Tehnikom *opus tessellatum* izrađuje se mozaik od kamenih kockica u obliku kvadra ili pravokutnika raspoređenih tako da stvaraju dekorativne, simetrične i pravilne motive. Kao vezivni materijal između kockica se stavlja malterski kit. *Opus vermiculatum* čine sitnije kockice složene tako da su im krajevi i međuprostori jedva zamjetljivi. Kockice su jednake veličine i istog formata, a izrađene su od dragocjenijeg kamena, stakla i glaziranih odlomaka posuđa. Motivi se prave tehnikom *opus vermiculatum* i često se kao gotove slike ugrađuju u ornamentalni okvir *tessellatum*. Ovakav način zidanja karakterističan je za puni razvitak rimskog betona (cementa). Naziv tehnike *opus tessellatum* obično je korišten da bi se razlikovali podni i zidni mozaik te tehnika *opus sectile* (*pavimentum sectile*) koja čini oblogu izrađenu od različitih vrsta materijala – opeke, komada eruptivnog kamenja itd. (ELU 1966: 597).

Na istočnoj jadranskoj obali registrirano je mnoštvo ostataka mozaika (Meder 2003). Među ostacima rimskih vila rustika mozaici su vrlo loše sačuvani, a potvrđeni su nalazima malih kockica (latinski *tessera* = kocka) (Kilić-Matić 2002).

Na otoku Ugljanu na mjestu zvanom Gospodska gomila nalazi se lokalitet Krševo gdje je uz more pronađen veliki nasip koji je uglavnom odnijelo more (Filipi 1965: 304). Uočeni su zidovi, a oko njih i mnoštvo ulomaka tegula i amfora. Stotinjak metara iza Gospodske gomile nalazio se mozaik od bijelih kamenčića koji je vlasnik zemljišta potpuno uništio.

Na položaju Stivan kod Mulina na otoku Ugljanu vlasnici su 1910. na čestici zemljišta broj 3698, čija je veličina 30 m x 45 m, otkrili tragove neke zgrade. Otkriveni tragovi ostaci su triju zidova koji su se protezali usporedno s morem. Na nekim položajima naišli su na mozaike koje su uništili. Danas na istoj površini ima još raznobojnih kockica. Sa sjeveroistočne strane njive odstranili su gomilu i otkrili građevinu površine oko 4 m x 5,5 m, danas poznatu pod imenom "Gušterna". Utvrđeno je da se radi o rimskoj piscini koja je vjerojatno bila dio antičkoga gospodarstva.

Na Kvintovoj njivi, također na otoku Ugljanu, na gomili istočno od Crikve vide se ostaci mozaika. Na čitavom okolnom prostoru (oko 100 cm x 130 cm)

square stones arranged so that they create decorative, symmetric and balanced motifs. Mortar is placed between the stones to bond them. *Opus vermiculatum* entails smaller tiles arranged so that the space between them is barely visible. The tiles are all equal in size and identical in form, and made of precious stones, glass and glazed ceramic pieces. Motifs are made in the *opus vermiculatum* style, and often as completed paintings they are placed in ornamental *tessellatum* frames. This building method is characteristic of the period when Roman cement experienced its full development. The name of technique, *opus tessellatum* is normally used to distinguish floor and wall mosaics from the *opus sectile* (*pavimentum sectile*) technique, which consists of coating made of various materials – brick, fragments of volcanic rock, etc. (ELU 1966: 597).

Numerous remains of mosaics have been recorded on the eastern Adriatic coast (Meder 2003). Among the remains of Roman *villae rusticae* the mosaics are very poorly preserved, while finds of small tessera have been confirmed (Kilić-Matić 2002).

The Krševo site is located on the island of Ugljan at a place called Gospodska Mound, where a large embankment was found next to the seashore that has been largely taken away by the sea (Filipi 1965: 304). Walls were noted, and around them a multitude of tegulae and amphorae fragments. Approximately one hundred meters behind Gospodska Mound, a mosaic made of white tiles was found but which had been completely destroyed by the owner of the land.

At Stivan, near Muline on the island of Ugljan in 1910 the owners of land plot no. 3698 found the traces of a building with dimensions 30 x 40 meters. The uncovered remains are the ruins of three walls that extend parallel along the sea. At some places they came upon mosaics that they destroyed. Today there are still tiles of various colors on the same surface. On the northeastern side of a meadow they removed a mound and uncovered a structure with dimensions of approximately 4 m x 5.5 m, today better known by the name 'Gušterna.' This was ascertained to be a Roman piscine that was probably part of a Roman farm.

The remains of a mosaic can be seen on a mound east of Crikva, on Kvintova Meadow, also on the island of Ugljan. There are numerous different fragments of pottery, Roman glass, and smaller and larger roof-tiles on the entire surrounding area (approximately 100 cm x 130 cm). Among them are nine fragments with various seals from the Pansiana factory.

The mosaic found on the islet of Katina, which is situated between Dugi and the Kornati islands, was

mnoštvo je raznovrsnih fragmenata posuda, rimskog stakla, manjih i većih komada krovnih opeka. Među njima je i devet komada s različitim žigovima tvornice PANSIANA.

Mozaik pronađen na otočiću Katini, koji se nalazi između Dugog otoka i Kornata, izvađen je i prenesen u muzej. Komponiran je od nekoliko gotovo jednakih rozeta promjera 95 cm. Rozete su sastavljene od nekoliko sfernih isječaka s više tonova koji se većinom pravilno izmjenjuju: crveno, bijelo, zeleno, crno, bijelo, sivo, zeleno – po pet puta u svakoj rozeti. Zvezdasti prostor između rozeta ispunjen je crveno-bijelo-zelenim pojasevima. Mozaik je bio pod jedne prostorije kojoj se zbog pomanjkanja zidova ne može precizno odrediti veličina (Suić & Petricioli 1952: 174, 187).

Tijekom svojih dugogodišnjih istraživanja D. Rendić-Miočević otkrio je u središnjem dijelu polja u sjeveroistočnom zaleđu Šibenika kod sela Danilo Gornje ostatke antičkih gospodarskih zgrada. Ostaci zidina nalaze se u predjelima Šematorij i Veruše. Smatra se da pronađeni objekti pripadaju dvjema vilama rustikama (jedna se nalazi iza istočnoga zida Groblja sv. Danijela, a druga na položaju Katuni) te ostacima gradskoga kolektora i građevinskoga objekta unutar groblja. Uz ostatke mozaika i oslikane žbuke nađeni su i antički grobovi u građevinama i oko njih. Tijekom 1999. u blizini Starog Šematorija pronađeni su ostaci zidova, tegula i ulomaka keramičkih posuda. Zaštitna su iskopavanja otkrila kameni zid sa žbukom i dio bazena s očuvanim mozaičkim podom koji se strmo spušta i ima kružni kameni lijevak. Popratni arheološki materijal upućuje na to da je ovaj gospodarski objekt nastao krajem 2. i početkom 3. stoljeća poslije Krista (Pedišić 1999/2000: 521, 527).

U Uvali sv. Petra kod Mandaline K. Stošić je uz more pronašao zgradu s porušenim zidovima (Stošić 1941: 33). Zove se "banjina" (od latinske riječi *balneum*, kupalište). Zgrada je duga 13 m, široka 5,6 m i visoka 4 m, a zidovi su debeli 1 m. Pred njom se vide dijelovi terasa s mozaikom, a sa strane je kamen živac.

Na položaju Grušine (Morinje) nalaze se ostaci prostrane ladanjsko-gospodarske zgrade. U ovoj uvali nalazi se Crkva sv. Lovre, a nedaleko od nje ostaci rimske vile rustike, koju spominje još i Šižgorić. Godine 1936. don K. Stošić je prilikom manjih iskopavanja otkrio jednostavan mozaik, obojene žbuke i, kako on navodi, "kupaonice s opekama" (Stošić 1941: 49). M. Zaninović pretpostavlja da se radi o bazenima za ulje ili vino.

Ostaci Gradine na otoku Murteru pripisuju se antičkom naselju Colentum, a prva je sistematska iskopavanja u ime Arheološkog muzeja u Splitu vodio

removed and taken to a museum. It is made of several almost identical rosettes with a diameter of 95 cm. The rosettes are composed of several spherical incisions with several tones that largely alternate regularly: red, white, green, black, white, gray, green – five times each on each rosette. The stellate space between the rosettes is filled with red, white and green bands. The mosaic was the floor of a room, although its size cannot be precisely determined due to the lack of walls (Suić & Petricioli 1952: 174, 187).

During his long years of research, D. Rendić-Miočević uncovered the remains of a Roman farm building in the center of field in the northeastern hinterland of Šibenik near the village of Danilo Gornje. The remains of a wall are located in the sections called Šematorij and Veruše. These structures are believed to belong to two *villae rusticae* (one is located behind the eastern wall of the St. Daniel Cemetery, and the other at Katuni) and the remains of an urban collector and structures within the cemetery. Besides remains of mosaics and painted mortar, Roman graves were also found in and around the structures.

During 1999, the remains of walls, tegulae, and fragments of ceramic pottery were found near Stari Šematorij. During rescue excavations, a stone wall with mortar and part of a pool with a preserved mosaic bottom with a steep depression leading to a round stone funnel were uncovered. Additional archeological materials indicate that this is a farm building that emerged at the end of the second and beginning of the third century AD (Pedišić 1999/2000: 521, 527).

K. Stošić found a building with collapsed walls on the seashore in Sveti Petar Cover near Mandalina (Stošić 1941: 33). It is called *banjina*, from the Latin term *balneum* – bath. The building is 13 m long, 5.6 m wide and 4 m high, while the walls are 1 m thick. Parts of a terrace with mosaics can be seen in front of it, while there is a vein of solid rock to one side.

The remains of a spacious estate/farm building are located at the Grušine (Morinje) site. The Church of St. Lawrence is located in this cove, and not far from it the remains of a Roman *villa rustica* that was even mentioned by Šižgorić. During a minor dig in 1936, Fr. K. Stošić uncovered a simple mosaic, painted mortar and, as he states, "a bathroom with tiles" (Stošić 1941: 49). M. Zaninović assumes that these are basins for oil or wine.

The remains of Gradina on the island of Murter have been attributed to the Roman settlement of Colentum, and the first systematic excavation conducted here on behalf of the Museum of Archeology

L. Jelić (od 1907. do 1909). Od 1966. do 1973. sistematska je arheološka istraživanja nastavio Arheološki institut Sveučilišta u Zagrebu pod vodstvom Duje Rendića-Miočevića surađujući s Gradskim muzejom u Šibeniku. Uz zapadnu obalu Gradine u neposrednoj su blizini mora bili vidljivi zidovi, a neki su od njih i nestajali pod morskom površinom. Prema sjeveru je groblje s Crkvom Gospe od Gradine, a iza nje pronađeni su ostaci zidova nekog zdanja. Dalje, prema rtu Gradine, nalaze se ruševine u obliku polukružne apside. Suradnica arheoloških istraživanja A. Faber (Faber 1998: 98, 122) u svom je izlaganju ove ostatke opisala kao "vilu s apsidom" u planu označenu kao objekt IV koji se proteže uz obalu u duljini od preko pedeset metara. U drugoj fazi gradnje ova je vila bila opskrbljena manjim, naknadno ugrađenim odnosno adaptiranim termalnim kompleksom unutar već postojećeg jugozapadnog krila koje je apsidalnim prostorom bilo odijeljeno od stambenoga kompleksa. Zidovi termi bili su obloženi pločicama ružičastoga mramora čiji su ulomci, zajedno s kockicama mozaika crne i bijele boje, nađeni unutar tih prostorija i oko njih. Tragovi podne žbuke, odnosno podloge mozaika, nalazili su se na bočnim zidovima na razini povišenoj oko 40 cm, što odgovara visini podnog hipokausta. U zgradi označenoj brojem XIII otkrivene su u prizemlju, ali na razini višoj od ulaznoga dvorišta, dvije prostorije s mozaikom crno-bijele boje. U jednoj je uočljiv motiv trokuta, a u drugoj motiv vjetrenjače ili rozeta s obrubnom pletenicom. A. Faber primjećuje da je tehnika izrade mozaika vrlo fina i da to upućuje na ranija stoljeća. Tome odgovaraju i pronađene krovne opeke sa žigovima radionica PANSI-ANA i NERONI PANS. Gradnja tih zdanja i njihova uporaba datiraju iz 1. i s početka 2. stoljeća kada se samo uz priobalje adaptiraju kuće srušene u potresu ili se ponovo gradi dio naselja.

Stanovnici Strožanca, mjesta nedaleko od Splita, svjedoče o tome kako se prilikom novovjekovnih gradnji i krčenja zemljišta sjeveroistočno i zapadno od areala crkvenoga kompleksa nailazilo na ostatke zidova i mozaika. Zbog položaja otkrivene arhitekture, njezine tlocrtne dispozicije, strukture građenja zidova i popratnog arheološkog materijala istraživači su pretpostavili da je na tom lokalitetu postojao rimski gospodarski kompleks s više međusobno povezanih zgrada različitih namjena. Pronađeni novac Valentinijana II. upućuje na to da je vila nastala krajem 4. stoljeća poslije Krista (Oreb 1999/2000: 447).

Na otoku Šolti na lokalitetima Studenac kraj Donjeg Sela i Banje u Rogaču nalaze se neidentificirane zgrade, a neke od njih imaju ostatke mozaika.

Na otoku Braču sjeveroistočno od Novoga Sela pod

in Split was led by L. Jelić (from 1907 to 1909). From 1966 to 1973, systematic archeological research was conducted by the Archeology Institute of the University of Zagreb, led by Duje Rendić-Miočević in cooperation with the Town Museum in Šibenik. Walls were visible along the western coast of Gradina, on the very seashore, and some of them disappeared beneath the sea's surface. A cemetery with the Church of Our Lady of Gradina is situated to the north, and behind it the ruins of a building's walls were found. Further on, toward the Gradina Promontory, there are ruins in the form of a semi-circular apse. An archeological research associate, A. Faber (Faber 1998: 98, 122) described these remains as "a villa with an apse," marked in the map as object IV which extends along the beach for a length of over fifty meters. In the second phase of construction, this villa was equipped with a smaller, subsequently built, or rather adapted, thermal complex within the already existing southwestern wing that was divided from the residential section by the apsidal space. The walls to thermae were covered with pink marble tiles, the fragments of which were found within these rooms and around them together with black and white mosaic tiles. Traces of floor mortar, i.e. the mosaic base, were on the lateral walls at a level raised 40 cm, which corresponds to the height of the hypocaust. Two rooms with black and white mosaics were found in the ground level and a level higher than the entry patio of the building designated under number XIII. A triangle motif is visible in one, while the other contains a windmill or a rosette with a lattice work on the edges. A. Faber noted that the technique used to make the mosaic was very refined and that this indicates an earlier century. This conclusion conforms with the roof tiles found with seals of the PANSIANA and NERONI PANS workshops. The construction of these buildings and their use dates to the first and beginning of the second century when only houses along the coast, otherwise destroyed in an earthquake, were adapted or part of the settlement was rebuilt.

The residents of Stožanac, a settlement not far from Split, testify to the discovery of remains of walls and mosaics during modern construction and clearing of land northeast and west of the church complex. The position of this discovered architecture, its floor-plan, construction structure of the walls and accompanying archeological materials led researchers to assume that a Roman farming complex existed at this site which had several mutually connected buildings for various uses. The money of Valentinian II found here indicates that the villa emerged at the end of the fourth century AD (Oreb 1999/2000: 447).

Unidentified buildings are located on the island of

brdom Velo Gračišće nalaze se ostaci vile rustike i piscina s još sačuvanim debelim slojem žbuke na pravilno klesanim zidovima. Nekoliko metara prema zapadu postoji još jedna manja piscina koja je veoma oštećena. Na okolnom su zemljištu posvuda ostaci zidova i jednostavnog mozaika bijele boje te ulomci keramike i opeke.

U Starom Gradu na otoku Hvaru devedesetih su godina 20. stoljeća provedena arheološka istraživanja na više lokacija u donjem dijelu Srednje ulice, i to u neposrednoj blizini rimskih mozaika poznatih od 1923. Prilikom adaptiranja prizemlja kuće Marka Račića (čest. zgr. 241 K. O. Stari Grad) tijekom 1989/1990. na sredini je prostora napravljena arheološka sonda. Na dubini od oko jednog metra u odnosu na današnju razinu poda prostorije i popločanja ulice otkriven je mozaik. Istraživanja su proširena te je otkriven rimski mozaik koji se dijelom prostire prema istoku pod susjednu kuću. Kompozicija mozaika sastoji se od više polja ukrašenih geometrijskim i biljnim ornamentima. Strane središnjega četverokuta omeđene su dvama manjim pravokutnim poljima. Na glavnoj ornamentalnoj plohi oblikovan je krug ispunjen sfernim trokutima koji se postupno smanjuju tvoreći pritom oblik rozete. Taj glavni motiv, uokviren kružnom bordurom, ispunjen je pravokutnim elementima u perspektivi. U kutovima kompozicije četverokutna su polja s različitim motivima: kombinacijom pletera i stiliziranog cvijeta. Prazne prostore prema kružnim elementima ispunjavaju trokuti i četverokuti s motivima djeteline s četiri lista i manjim četverokutima. Glavno ornamentalno polje oblikuje se kao zaseban tapet poput široke bordure i ukrašen je biljnim motivima. Slobodno razvijene vitice i cvjetovi akanta ispunjavaju njegovu površinu. Cijeli ukrasni dio mozaika prati široka vrpca od bijelih kockica slaganih tehnikom *opus reticulatum*. Mozaik visoke kvalitete ima izniman kolorit i spektar boja. Na zapadnom dijelu mozaika nazire se trag pregradnog zida širine oko 20 cm koji je dijelio tu prostoriju od one susjedne. Iza tog zida otkriven je početak novoga mozaičnog tapeta. Očuvan je dio jednostavne bordure od nekoliko redova crnih kockica koja je uokvirivala novo polje. Mozaik se dalje prostire ispod zida kuće prema ulici Vagonj. S južne strane obaju mozaika otkriven je zid građevine koji je zatvarao tu prostoriju. Zid je građen od izduženih klesanaca slaganih u pravilnim redovima načinom svojstvenim grčkoj tehnici gradnje.

U neposrednoj blizini ovog mozaika, u kući na uglu Srednje ulice i ulice Vagonj, nalaze se rimski mozaici otkriveni 1923. koji su zatrpani i označeni prilikom popločenja ulice. Iz sačuvane je dokumentacije poznato kako su se mozaici pružali u odnosu na raster

Šolta at the sites of Studenac near Donje Selo and Banja in Rogač, and some of them contain remains of mosaics.

The remains of a *villa rustica* and piscine with a still preserved thick layer of plaster evenly-sculpted walls are located on the island of Brač northeast of Novo Selo under Velo Gračišće Hill. Several meters westward there is one more smaller piscine that has sustained heavy damage. The remains of walls and a simple white mosaic and ceramic and brick fragments can be found throughout the surrounding terrain.

During the 1920s, archeological research was conducted at several sites in Stari Grad on the island of Hvar in the lower section of Srednja street, in the immediate vicinity of Roman mosaics known to exist since 1923. During renovation of the ground floor of the house owned by Marko Račić (building plot no. 241, Stari Grad Cadastral Municipality) during 1989/90, an archeological probe was placed in the center of the space. A mosaic was discovered at a depth of approximately one meter in relation to the current floor level of the room and cobblestones on the street. The examination was expanded, and a Roman mosaic was discovered that partially extends toward the east under the neighboring house. The mosaic consists of several fields decorated with geometric and floral ornaments. The sides of the central square are bordered with two smaller rectangular fields. The main ornamental surface contains a circle filled with spherical triangles that gradually shrink, thereby forming a rosette. This principal motif, framed by a circular bordure, is filled with rectangular elements in perspective. The corners of the composition contain rectangular fields with various motifs: a combination of lattice works and stylized flowers. The empty spaces toward the circular elements are filled with triangles and rectangles containing four-leaf clover motifs and smaller rectangles. The main ornamental field is formed as a separate tapestry with a broad bordure, decorated with floral motifs. Freely developed curls and acanthine flowers cover its surface. The entire decorative portion of the mosaic is accompanied by a broad ribbon made of white tiles set in *opus reticulatum* style. This high-quality mosaic exhibits exceptional colorism and a spectrum of colors. The trace of an approximately 20 cm partition wall can be perceived at the western end of the mosaic. This wall separated this room from another. The beginning of a new mosaic tapestry was discovered behind this wall. A part of the simple bordure, consisting of several rows of black tiles framed by a new field, has been preserved. The mosaic continues to extend below the wall of the house toward Vagonj street. The wall of a structure that closed this room was discovered on the south-

ulica i susjednih kuća. J. Jeličić-Radonić zaključuje da se radi o dva mozaična tapeta koji dijelom zadiru ispod zidova kuća i dvorišta (Jeličić-Radonić 1995: 153). Sa sjeverozapadne strane pronađeni su antički zidovi koji pod pravim kutom zatvaraju prostoriju s mozaicima. Mozaik u zapadnom dijelu prostorije veća je geometrijska kompozicija čija se jedna trećina nalazi ispod dvorišta susjedne kuće Ostojić. Bordura u obliku troprute pletenice uokviruje jednostavnu geometrijsku shemu. U središtu četverokuta je krug koji tangiraju četiri polukruga. Četvrtine krugova ispunjavaju kutove četverokuta. Pojedini elementi – krug, polukrugovi i četvrtine kruga – imaju i različite bordure. Unutar kruga šesterostrani je element složen od isječaka krugova i uokviren pletenicom. U polukrugovima su rastvoreni akantovi cvjetovi obrubljeni trokutima. Drugačije koncipirani trokutasti elementi zatvaraju četvrtine kruga. Ta polja ispunjena su jednostavnim geometrijskim ornamentima u obliku trokuta i isječaka krugova. Slobodne prostore kružnih elemenata kompozicije ispunjavaju pravocrtni i trokutasti motivi. Drugi mozaični tapet pruža se s istočne strane spomenutog tapeta. Njegova složena geometrijska ornamentika sastoji se od kontinuiranih meandarskih prepleta načinjenih od pletenica razdvojenih tamnim crtama na bijeloj podlozi. Budući da se ornamentalna shema neprekinuto prostire širinom cijele Srednje ulice i ide dalje ispod zidova kuća, veličina tog mozaičnog tapeta ne može se sa sigurnošću utvrditi. Sa sjeverne strane zapadnoga tapeta pruža se bordura od tamnih kockica koju prate tri reda bijelih kockica, a zatim slijede bijele kockice slagane tehnikom *opus reticulatum*. Sličan obrub uočen je i na novootkrivenom mozaiku pa takav način obrubljivanja cijele kompozicije nizom bijelih kockica slaganih tehnikom *opus reticulatum* Jeličić-Radonić tumači kao pravilo mozaičke radionice (Jeličić-Radonić 1995: 154). Četiri dosad otkrivena mozaika rimske građevine s različitim geometrijskim kompozicijama pokazuju sličnosti s primjerima iz Salone koji datiraju iz 2–3. stoljeća poslije Krista. Radi se o mozaicima koji potječu iz tzv. “namjesnikove palače”, a to naročito potvrđuje mozaičan tapet koji prikazuje Orfeja. Jeličić-Radonić zaključuje da svi starogradski mozaici pripadaju jedinstvenom sklopu arhitekture, a na temelju njezine veličine i uređenja dokazuje da bi to mogla biti javna građevina ili *villa urbana*. Kako se mozaici nalaze izvan poteza sjevernoga gradskog bedema koji je očuvan u konobi Gromotorovih, pretpostavlja se da se grad u rimsko vrijeme širio izvan svog prvobitnog perimetra. Još uvijek je otvoreno pitanje izvornog izgleda i veličine antičkoga Pharosa. Ova su istraživanja pokazala da se nakon dolaska

ern side of both mosaics. The wall was constructed from elongated sculpted stones placed in regular order in a manner typical of Greek construction. The Roman mosaics discovered in 1923, which were buried and designated during the placement of stones on the street, are located in the immediate vicinity of the aforementioned mosaic, in a house at the corner of Srednja and Vagonj streets. The preserved documentation shows how the mosaics extended in relations to the layout of the streets and neighboring houses. J. Jeličić-Radonić concludes that these are two mosaic tapestries which partially extend under the walls of houses and yards (Jeličić-Radonić 1995: 153). Roman walls were found on the northwestern side which close the room with mosaics at a right angle. The mosaic in the western part of the room has a larger geometric composition, and one third of it is located under the yard of the neighboring Ostojić house. A bordure in the form of a tri-band lattice frames the geometric design. There is a circle in the middle of the rectangle with four semi-circles touching it in tangent. Quarter-circles fill in the corners of the rectangle. Individual elements—circles, semi-circles and quarter-circles—have different types of bordures. The circle contains a six-sided element made of circular sections and framed by a lattice-work. The semi-circles contain blossoming acanthine flowers bordered by triangles. Differently-conceived triangular elements closed the quarter-circles. Those fields are filled in with simple geometric motifs such as triangles and circle segments. The empty spaces of the circular elements of the composition are filled in with linear and triangular motifs. Another mosaic tapestry extends from the eastern side of this tapestry. Its complex geometric ornamentation consists of continuous meandering, separate dark lines interwoven on a white base. Since the ornamental scheme extends along the entire width of Srednja street and further on under the walls of houses, the size of this mosaic tapestry cannot be ascertained with certainty. A bordure of dark tiles accompanied by three rows of white tiles followed by white tiles set in *opus reticulatum* style extends from the northern side of the western tapestry. A similar edge was noted in the newly-discovered mosaic, so this type of bordering an entire composition with a series of *opus reticulatum* style white tiles has been interpreted by Jeličić-Radonić as the standard of a mosaic workshop (Jeličić-Radonić 1995: 154). The four mosaics with varying geometric compositions in Roman buildings discovered so far exhibit similarities to the examples from Salona, which date back to the second and third centuries AD. These are mosaics that come from the so-called “regent’s palace,” and

pod rimsku vlast koriste i preuređuju brojne starije građevine, a grade se i one novih sadržaja.

Prilikom gradnje ceste za Vrbosku 1958. sjeveroistočno od Staroga Grada u predjelu Storči otkriveni su između glavne trafostanice i Gospojice ostaci antičke vile rustike. Pronađeni su dijelovi zidova i prostog bijelog mozaika, ulomci rimske keramike i dijelovi stupova.

Na predjelu zvanom Kupinovic uz novu asfaltnu cestu na pola je puta između Staroga Grada i Dola na otoku Hvaru istražena rimska vila rustika. Istraživanja je od 1978. do 1981. vodio M. Zaninović (Zaninović 1987: 91, 96). Prilikom iskopavanja u različitim su prostorijama nađene kamene kockice mozaika bijele i crnkaste boje, poremećene i razbacane u šutu.

Na lokalitetu Stanjica, također na otoku Hvaru, zabilježio je B. Vranković nalaz dvaju tokulara, *cellae vinariae* i mozaika, pa se pretpostavlja da je i tu postojao gospodarski objekt.

U uvali Rake na sjevernoj strani otočića Šćedra, smještenog ispred južne obale otoka Hvara, pod žalom se nalaze ostaci mozaika (Vrsalović 1980/1981: 108). Kako istočna strana jadranske obale neznatno tone, možemo pretpostaviti da je na tom položaju postojala gospodarska kuća koja je uglavnom devastirana zemljoradnjom. Vila se prostirala od samoga mora (to potvrđuju ostaci vivarija, pristaništa, mozaik u žalu) preko današnjega vinograda pa sve do zadnjih kuća.

Godine 1996. C. Fisković je na otoku Lastovu u vinogradima podno brijega Podšpilja u sjevernoj strani polja Barja uočio ulomke jednostavnog mozaika od bijelih i zagasitih kamenčića pričvršćenih na vapnenu podlogu (Fisković 1966: 7). Još 1933. P. Marconi je u sklopu naselja Ubli otkrio prostor rimske kuće ukrašene figuralnim podnim mozaikom. Tuda su se pružale dvije prostorije izduženoga pravokutnog oblika (16 m x 4 m). U sjevernom dijelu nalazio se bazen za kupanje (dimenzija 2,4 m x 0,8 x 0,5 m). Rubovi su mu obloženi dvostrukim nizom mramornih pločica, a dno je pokriveno mozaikom od bijelih kockica. Ispred bazena nalazio se podni mozaik sa slikom dupina. Sačuvana je dupinova repna peraja realizirana u smeđim i sivim nijansama. Figuralno je polje bilo uokvireno jednostavnom bordurom od dva reda kockica svijetlosive i tamnosive boje (J. Jeličić-Radonić 2001: 198, 201).

Na temelju sistematskog proučavanja mozaika zaključeno je da su postojale i pojedine radionice.¹

this is particularly confirmed by the mosaic tapestry depicting Orpheus. Jeličić-Radonić concludes that all of the Stari Grad mosaics belong to a unified architectural complex, and its size and layout indicate that it could have been a public building or a *villa urbana*. Since the mosaics are located outside of the line of the northern urban defensive wall preserved in the Gromotorovi inn, it has been assumed that the town grew out of its original perimeter during Roman times. The question is still open as to the original appearance and size of ancient Pharos. This research has shown that after the establishment of Roman rule numerous older buildings were used and renovated, while new ones were also constructed.

During construction of the road to Vrboska in 1958, the remains of a Roman *villa rustica* were discovered northeast of Stari Grad in the Storči area between the main transformer station and Gospojica. Parts of walls and simple white mosaic, as well as Roman ceramic fragments and sections of pillars, were found.

A Roman *villa rustica* was examined in an area called Kupinovic along a new paved road halfway between Stari Grad and Dol on the island of Hvar. Research from 1978 to 1981 was led by M. Zaninović (Zaninović 1987: 91, 96). During excavations in various rooms, white and black stone mosaic tiles were found, damaged and strewn about in construction waste. B. Vranković recorded findings of two wine cellars (*cellae vinariae*) and mosaics at the Stanjica site, also on the island of Hvar, so it has been assumed that a farming facility existed here.

The remains of a mosaic are located in Rake Cove on the northern side of the islet of Šćedar, in front of the southern shore of the island of Hvar (Vrsalović 1980/81: 108). Since the eastern side of the Adriatic coast is sinking negligibly, we can assume that a farmhouse existed at this site, which has been largely devastated by cultivation. The villa extended from the very seashore (confirmed by the remains of a vivarium, a jetty, a mosaic on the beach), across the current vineyard up to the last houses.

In a vineyard on the island of Lastovo under Podšpilje Hill in 1966, C. Fisković noticed the fragments of a simple mosaic made of white and dark brown stones secured to a limestone base (Fisković 1966: 7). In 1933, P. Marconi discovered part of a Roman house decorated with a figural floor mosaic as part of the settlement of Ubli. From here, two rooms with an elongated rectangular form (16 m x 4 m) extended. A swimming pool (2.4 m x 0.8 x 0.5 m) was located in its northern section. Its sides are covered by a double series of marble plates, while the bottom is covered with a mosaic made of white tiles. A floor mosaic in front of the pool features

¹ Vidi radove Branka Matulića i Anemari Bugarski-Mesdijan navedene u popisu literature.

OPUS SIGNINUM

Konačno, posljednja utvrđena tehnika *opus signinum* (*coccio pesto*) konglomerat je malenih fragmenata keramike i jako stučene sitne žbuke korišten za oblaganje podova i zidova izloženih vodi i vlazi. U stvari, radilo se o vapnu pomiješanom s razmrvljenim opekama koje je služilo kao hidraulično sredstvo pri izgradnji cisterni i piscina.

Sve ove tehnike gradnje i upotreba *caementiciuma* došle su zajedno s rimskom kolonizacijom. Najranija izgradnja vila rustika na istočnoj jadranskoj obali i otocima smješta se u period ranijeg Carstva, odnosno u 1. stoljeće poslije Krista.

U Maloj Proversi u najdonjem je sloju prostorije C, između II. i III. potpornjaka zida B, pronađen Trajanov novac iz oko 98. godine poslije Krista koji predstavlja *ante quem* za dataciju. Brojne krovne opeke pronađene na Dračevcu udaljenom 10 km od Zadra sa žigom SOLONAS i PANSIANA upućuju na to da je ovaj sklop morao nastati u 1. stoljeću poslije Krista.

Tehnika gradnje *opus reticulatum* evidentirana u Velom polju u Lombardi na otoku Korčuli javlja se u Pompejima malo prije sredine 1. stoljeća poslije Krista, ali ne mnogo prije Oktavijanovih operacija u ovim našim krajevima. Taj bi podatak mogao pomoći u dataciji ove gospodarsko-ladanijske građevine koja je prema M. Zaninoviću građena već krajem 1. stoljeća poslije Krista.

Na otočiću Sutvari vidljivi je dio zida građen od opeke tehnikom *opus spicatum*. Ovaj način zidanja s poda je prenesen na uspravni zid u Augustovo doba, nakon čega se koristio u Italiji te je čest u Lombardiji od 8. do 15. stoljeća. Izvan Italije rijetko se upotrebljavao. U crkvi na Sutvari sačuvan je na vanjskom južnom zidu, a na sjevernom zidu nije pravilan, nego se sastoji od koso položenog i ravno postavljenog kamenja.

U Kostreni je od pokretnog arheološkog materijala pronađeno više fragmenata amfora i novac Konstantina II. (337.–340.) kovan u Antiohiji (Matejčić 1982: 26, 27). To potvrđuje da je vila korištena i tijekom 4. stoljeća poslije Krista.

Praksa gradnje u kamenu na ovom području potječe još iz prapovijesnih vremena. Neke tehnike i strukture sistematizirane prema pravilima i zakonitostima rimskoga graditeljstva u osnovnoj se formi pojavljuju i prije prihvaćanja stranih utjecaja.

Kao građevinski materijal dominirao je kamen, a opeka je imala sekundarnu ulogu.

Glina se kao vezivno tkivo upotrebljavala sama ili pomiješana sa živim vapnom. Sama glina često se pojavljuje kao izolacijski sloj ognjišta u skromnijim

a picture of a dolphin. The dolphin's tail-fin, rendered in brown and gray tones, has been partially preserved. The figural field has been framed with a simple bordure made of two rows of light-gray and dark-gray tiles (Jeličić-Radonić 2001: 198, 201).

A systematic examination of the mosaic led to the conclusion that there were individual workshops.¹

OPUS SIGNINUM

Finally, the last confirmed example of *opus signinum* (*coccio pesto*) is a conglomerate of small ceramic fragments and heavily beaten fine mortar used to cover floors and walls exposed to water and moisture. This was actually limestone mixed with powdered brick which served as a hydraulic means when constructing cisterns and piscines.

All of these construction techniques and uses of *caementicium* accompanied Roman colonization. The earliest construction of a *villa rustica* on the eastern Adriatic coast and islands is dated to the early Imperial era, i.e. the first century AD.

A Trajan coin from about the year 98 AD was found in Mala Proversa in the lowest layer of room C, between buttresses II and III of wall B; it represents an *ante quem* for dating. Numerous roof tiles found at Dračevac located 10 km from Zadar and bearing the seal of SOLONAS and PANSIANA indicate that this complex must have emerged in the first century AD.

The *opus reticulatum* construction technique recorded in Velo polje in Lombarda on the island of Korčula appeared in Pompeii somewhat prior to the first century AD, but not much before Octavian's operations in Croatia's regions. This fact could help in dating this farm-estate structure, which according to M. Zaninović was constructed already at the end of the first century AD.

Part of a wall made of brick in the *opus spicatum* style was found on the islet of Sutvara. This building method was transferred from floors to walls during the Augustan era, after which it was used in Italy and was also frequent in Lombardy from the eighth to the fifteenth centuries. It was rarely used outside of Italy. It has been preserved on the outer southern wall in the little church on Sutvara, while it is not properly aligned on the northern side, rather it consists of stones placed at both angles and upright.

Among the movable artifacts, several amphorae fragments and Constantine II (337–340) coins minted in Antioch were found in Kostrena (Matejčić

¹ See works by Branko Matulić and Anemari Bugarski-Mesdijan cited in the bibliography.

kućama, što je vjerojatno nastavak tradicije pre-drimskog vremena (Suić 1975: 106).

Nakon dolaska Rimljana na istočnoj su se jadranskoj obali dogodile revolucionarne promjene i u građevinarstvu. Započela je gradnja lokalnim materijalima kao što su vapno, opeka i obrađeni kamen, ali u novom obliku koji nije bio poznat starosjediocima. Veliku važnost za puni razvoj rimskoga cementa imalo je otkriće crvenoga vulkanskog pijesaka (*pozzolana*) iz Puteolija (današnji Pozzuoli) na obali Kampanije. *Pulvis puteolanus* imao je hidraulični karakter, a pomiješan s vapnom davao je rimski cement velike čvrstoće. To nije bilo iznenadno otkriće, nego rezultat dugotrajnoga praktičnog iskustva. Vitruvije je ukazao na to da se 20-ih godina 1. stoljeća prije Krista rimski cement počeo široko primjenjivati. Studije spomenika potvrđuju da se pozzolanska žbuka prvi put pojavljuje u Rimu u Cezarovo vrijeme, a svakodnevno se upotrebljava tek u Augustovo vrijeme. Čak se i pedeset godina kasnije, u Klaudijevo vrijeme, još uvijek izvozi iz Puteolija za gradnju njegove luke u Ostiji.

Upotreba maltera jedna je od najvažnijih novina koju je donio antički svijet na istočnu jadransku obalu. To je bila osnova za sve građevne strukture, a sam je malter tvorio temeljnu građu samosvojne strukture nazvanu *opus caementicium*. Naziv je dobila prema sitnom kamenu (*caementum* = sječeni kamen, zidarski kamen) koji se dodavao malternoj smjesi (*concertum*). Malter se sastojao od pijeska i vapna u pogodnom omjeru pomješanih s većom ili manjom šljakom. Tzv. hidraulički malter kojim su se oblagale stijenke cisterna za vodu dobivao se miješanjem sitnog i krupnijeg pijeska, ugašenog vapna i tučene opeke, a nanosio se na zid u više slojeva (obično tri), od kojih je posljednji, vanjski, bio zaglađen (*ligadina*) i imao finiji sastav (Suić 1975: 106).

1982: 26, 27). This confirms that the villa was used even during the fourth century AD.

The practice of building in stone in this region has its origins in prehistoric times. Some of the techniques and structures systematized according to the rules and standards of Roman construction appeared in their basic form even before the adoption of foreign influences.

Stone was the dominant construction material, while brick played a secondary role. Clay was used as a bonding material alone or mixed with quicklime. Clay is often found alone as an insulation layer in the hearths of more modest homes, which is probably a continuation of traditions from pre-Roman times (Suić 1975: 106).

After the arrival of the Romans on the eastern Adriatic coast, revolutionary changes also occurred in architecture. Construction commenced with local materials such as limestone, brick and cut stone, although in new forms not recognized by the indigenous population.

The discovery of red volcanic sand (*pozzolana*) from Puteoli (today's Pozzuoli) on the coast of Campania had great significance for the full development of Roman cement. *Pulvis puteolanus* had a hydraulic character, and mixed with lime it made Roman cement very firm. This was not a sudden discovery, but rather the result of many years of practical experience. Vitruvius pointed out that by the twenties of the first century BC Roman cement became widely used. Studies of monuments confirmed that *pozzolana* mortar appeared for the first time in Rome during the lifetime of Julius Caesar, while came into everyday use during the Augustan era. Even fifty years later, during the reign of Claudius, he still exported it from Puteoli to construct his port in Ostia.

The use of mortar is one of the most important novelties brought to the eastern Adriatic coast by the civilization of Classical Antiquity. This was the foundation for all buildings, and mortar was the basic material for stand-alone structures called *opus caementicium*. Its name derives from tiny stones (*caementicium* – cut stone, masonry stone) which was added to the mortar mix (*concertum*). The mortar consisted of sand and lime in an appropriate ratio mixed with larger or smaller gravel. So-called hydraulic mortar that was used to line the walls of water cisterns was obtained by mixing coarse and fine sand, slaked lime and pounded bricks, and applied to the wall in several layers (usually three), of which the last, external, layer was finished (*ligadina*) and had a finer composition (Suić 1975: 106).

KRATICE / ABBREVIATIONS

ARR	Arheološki radovi i rasprave
ELU	Enciklopedija likovnih umjetnosti
GZM	Glasnik Zemaljskog muzeja BiH u Sarajevu
HAD	Hrvatsko arheološko društvo
JAZU	Jugoslavenska akademija znanosti i umjetnosti
OA	Opuscula archaeologica
PPUD	Prilozi povijesti umjetnosti u Dalmaciji
SHP	Starohrvatska prosvjeta
VAHD	Vjesnik za arheologiju i historiju dalmatinsku

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