VISHVESHVARA TEMPLE BASE AND ELEPHANTS

Report of the Institute of Conservation (IoC), University of Applied Arts Vienna

Fig. 1: Overview of the Vishveshvara

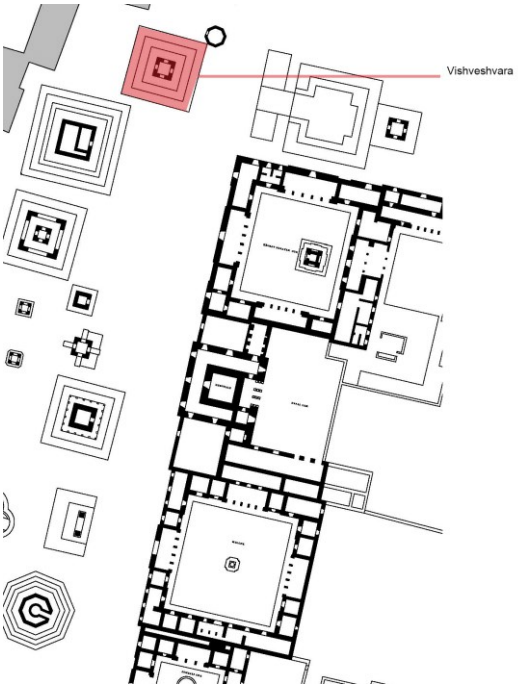


Fig. 2: Location within the Darbar Square

Universität für angewandte Kunst Wien - Institut für Konservierung und Restaurierung / University of Applied Arts Vienna - Institute of Conservation
Institutsleitung / Head of Institute o.Univ.-Prof. Mag. Dr. Gabriela Krist, *UNESCO Chair on Conservation and Preservation of Tangible Cultural Heritage*
Salzgries 14, 1., 3.-5. OG, 1010 Wien / Austria, T +43 1 711 33 4810, F +43 1 711 33 4819, kons-rest@uni-ak.ac.at, konservierung-restaurierung.uni-ak.ac.at

Data Sheet

Description

The Vishveshvara Temple was set up in 1627 in the Darbar Square. The building combines brick masonry and elaborately carved timber framing, a characteristic of Newar architecture. Its projecting roofs are another striking feature of this type of traditional local architecture. The temple is built on a raised stepped plinth. Its sanctum in the centre is accessible from stairs in the east flanked by a pair of stone elephants with riders. The square base of the outer ambulatory is encompassed with stone elements; blocks with supporting function, made out of calcitic schist, are arranged alternately with decorative elements made of siliceous sandstone.
In terms of architectural design, the establishment of this two-tiered temple with an ambulatory of 20 pillars constituted a revolutionary act in the region.
The building suffered from severe damage after the earthquake. The IoC was entrusted with the in-situ conservation of the stone base and the two elephant sculptures flanking the stairway to the entrance of the temple; the following short report thus focuses on these building features only.

Names	Vishwanath, Vishweshwar, Vishwonath, Bishwa Nath Mandir	
Dated	1627	
Measurements (H x W x D)	Total of temple base (W x D): 8 x 8 m Decorative stone blocks (deities and vahanas): 40-45 x 90 x 30-100 cm Stone basis (lions) for wooden pillars: 40-45 x 35-50 x 75-95 cm Stone basis (lions) for corner pillars: 40-45 x 75-85 x 75-85 cm	
Materials/Technology	Stone	
Interventions (IoC)	Survey	2016, 2018
	Mapping	-
	Sampling	-
	Analyses	-
	Conservation	2018, 2019
	Maintenance	-
Team (IoC)	Gabriela Krist, Marija Milchin, Martina Haselberger, Katharina Fuchs	
Academic Research (IoC)	-	

Survey: Materials and Technology (Base and Elephants)

- Base of the temple is filled up with bricks, rubble stone and earth and was paved with flat stone tiles
- Base of the outer ambulatory is encompassed by stone blocks, arranged in three layers: flat stone slabs on the bottom, simply carved bases, and rectangular to cuboid and elaborately decorated stone blocks on the top
- Elements are either made of sandstone [1] and calcitic schist [2]
- Partly later introduced pointing, based on cement mortar

Temple Base:

- Similar structure to the Harishankara Temple
- Blocks with supporting function (wooden columns on top) including corner stones are decorated with lion promotes and made of calcitic schist [2]
- Decorative blocks in between the schist blocks are fine carved showing depictions of wisdom bearers and other sceneries, they are made of sandstone [1]

Elephants:

- Multi part structure of small stone sandstone [1] blocks, historically set without mortar

Fig. 3: Lion bust corner stone, 2018

Fig. 4: Detail of fine carved sandstone element, 2018

Fig. 5: Detail of floral ornament at the door sill, 2018

Fig. 6: Stone layering (leg); toolmarks (lower part), 2017

Fig. 7: Overview of temple entrance with stone elements, 2018

Fig. 8: Detail of carved stone slab at the temple entrance, 2018

Previous (Conservation) Interventions

Unknown	Introducing cement joints and cement-based completion
(Before) 1974	Riders of the elephants collapsed (photography of Mary Slusser, 1974)
1992	Reconstruction and conservation of one of the elephants and both riders after the collapse of the temple roof in 1989

Survey: Condition and Causes of Decay (2018)

Temple Base:

- Heavily soiled carved stone blocks (thick dust layer and other greasy residues, probably religious offerings)
- Hairline cracks
- Cement mortar residues in and around joints
- Partial dark homogeneous crust on sandstone blocks
- Displaced stone blocks due to the earthquake 2015
- Burst and delaminated stone elements (within layers of the stone structure or at statically stressed areas)
- Broken parts
- Sanding of sandstone (particularly on fractured surfaces)
- Biological colonisation

Elephants:

- Burst stone block due to iron corrosion (formerly introduced iron reinforcement)
- Insufficient joints (inappropriate material or damaged joint mortar)
- Biological colonisation (especially at damaged joints and horizontal areas)
- Few areas (back and lower parts) with blackish crusts

Fig. 9: Elephant: burst stone block due to corrosion

Fig. 10: Heavily soiled stone block (covered with dust), 2017

Fig. 11: Burst stone block with figurative decoration, 2017

Fig. 12: Heavily soiled stone block (covered with dust), 2018

Fig. 13: Infill with cement mortar, 2018

Fig. 14: Elephant: Biological colonization, 2018

Fig. 15: Elephant: broken and inappropriate joints, 2018

Fig. 16: Elephant: inappropriate completion, 2018

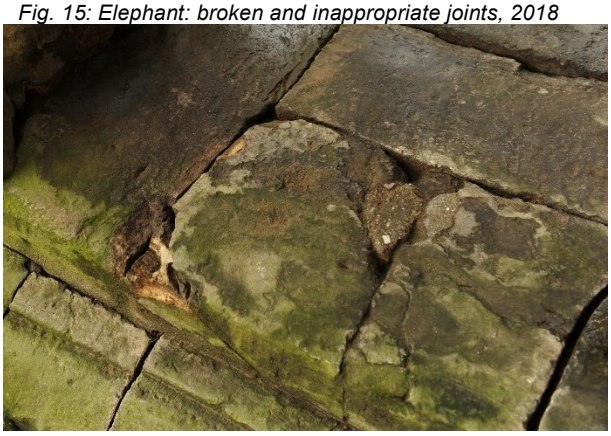


Fig. 17: Elephant: broken edges of blocks at plinth, 2018

Conservation (IoC)

Temple Base:

- Uncovering of the stone blocks by removal of the stone tiling embedded in cement mortar
- Dry cleaning with chisels and brushes to remove mortar residues and loose deposits/dust
- Wet cleaning with water
- Biocide treatment, QUATS diluted in water 2 %, 24 hours exposure time, afterwards cleaning with water (sandstone)
- Mechanically and chemically removal of greasy residues and sticky soiling with dentist tools/scalpel and acetone/white spirit
- Adjustment of stone blocks in their former position, embedded in suitable mortar
- Gluing of completely broken stone blocks with epoxy resin and pinning with carbon fibre rods (sandstone)
- Re-adhering of smaller fragments with acrylic resin (sandstone) or epoxy resin (schist)
- Backfilling of cracks with injections of acryl resin (first 10% in acetone, then 30% in acetone) (sandstone)
- Micropointing of edges along fractures and splitting areas (sandstone)
- Introducing stainless steel needles/pins were necessary (broken parts and statically stressed areas)
- Pointing of joints

Elephants:

- Removing of joint mortar
- Removing of earth and other deposits at the plinth with spatula/chisel
- Removing of repair mortars or reworking with hammer and chisel to better fit to shape and contour of original stone blocks
- Dry cleaning with brushes to remove loose deposits and dust
- Wet cleaning with water
- Biocide treatment, QUATS diluted in water 5%, 24 hours exposure time, afterwards cleaning with water
- Removing rust from a formerly introduced iron reinforcement (left front leg)
- Taking apart broken trunk (iron rod), upper part of rod was replaced with carbon fibre rod, while lower part of iron rod was treated with glass fibre pin to remove corrosion, uncovered iron was coated with lead paint (minium) removed parts of the trunk were glued back in place with acrylic resin
- Replacing of heavily decayed or missing blocks with stone indents
- Pointing of open joints
- Retouching of pointing with acqua sporca

Conservation Materials* and Recipes used:
- Akepox 2010 (Akemi)
- Carbon fibre rod
- Minium in linseed oil (Mennige in Leinöl Kremer Pigmente Gmbh & CO KG)
- Paraloid B72 in acetone
- QUATS

Mortar for bedding / pointing / micropointing: 1 vol. part natural hydraulic lime : 4 vol. parts sand (depending on the scope of application, sands with different hues were used or bore dust added)
- natural hydraulic lime NHL 3.5 LaFarge
- local sand
- bore dust

* Product / technical data sheets can be found in the supplement [A]

Fig. 18: Dry cleaning of stone block, 2018

Fig. 19: Removing earth within the joints, 2018

Fig. 20: Wet cleaning with water of carved stones, 2018

Fig. 21: Gluing of displaces elements, 2018

Fig. 22: Applying the setting mortar for a replaced stone, 2018

Fig. 23: Gluing and replacing stone blocks, 2018

Fig. 24: Preparing the fitting stone completion, 2018

Fig. 25: Detail of a fitted completion without retouching, 2018

Fig. 26: Gluing of broken stone block, 2018

Fig. 27: Backfilling of small cracks, 2018

Fig. 28: Elephant: removal of microbiological growth

Fig. 29: Elephant: stone indent

Fig. 30: Elephant: repointing

Fig. 31: Elephant: reassembled trunk after repointing

Before and after Conservation

Fig. 32: Right elephant before conservation, 2018

Fig. 33: Right elephant after conservation, 2018

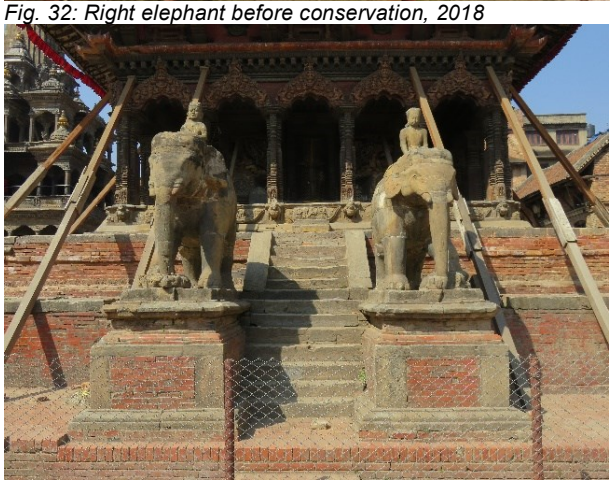


Fig. 34: Elephants before conservation, 2017

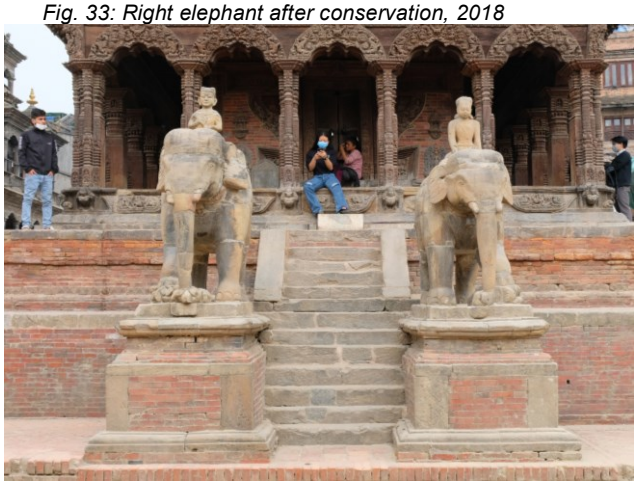


Fig. 35: Elephants after conservation, 2022

Fig. 36: Stone base before conservation, 2017

Fig. 37: Stone base after conservation, 2022

List of Publications / Reports (IoC)

Haselberger, Martina, Ranjitkar, Rohit, and Gabriela Krist. 2021. “Post-Earthquake Recovery and Conservation-Restoration in Patan, Nepal.” In *Analysis of Case Studies in Recovery and Reconstruction, Case Studies*, Vol. 2, edited by ICCROM and ICOMOS, 6-37. Rome: ICCROM and ICOMOS.

Krist, Gabriela, Milchin, Marija and Martina Haselberger. 2016. “The Durbar Square and the Royal Palace of Patan, Nepal – Stone Conservation before and after the Great Earthquake of April 2015.” *In Science and Art: A Future for Stone: Proceedings of the 13th International Congress on the Deterioration and Conservation of Stone*, Volume II, edited by John Hughes and Torsten Howind, 1171-1180. Paisley: University of the West of Scotland.

Supplements

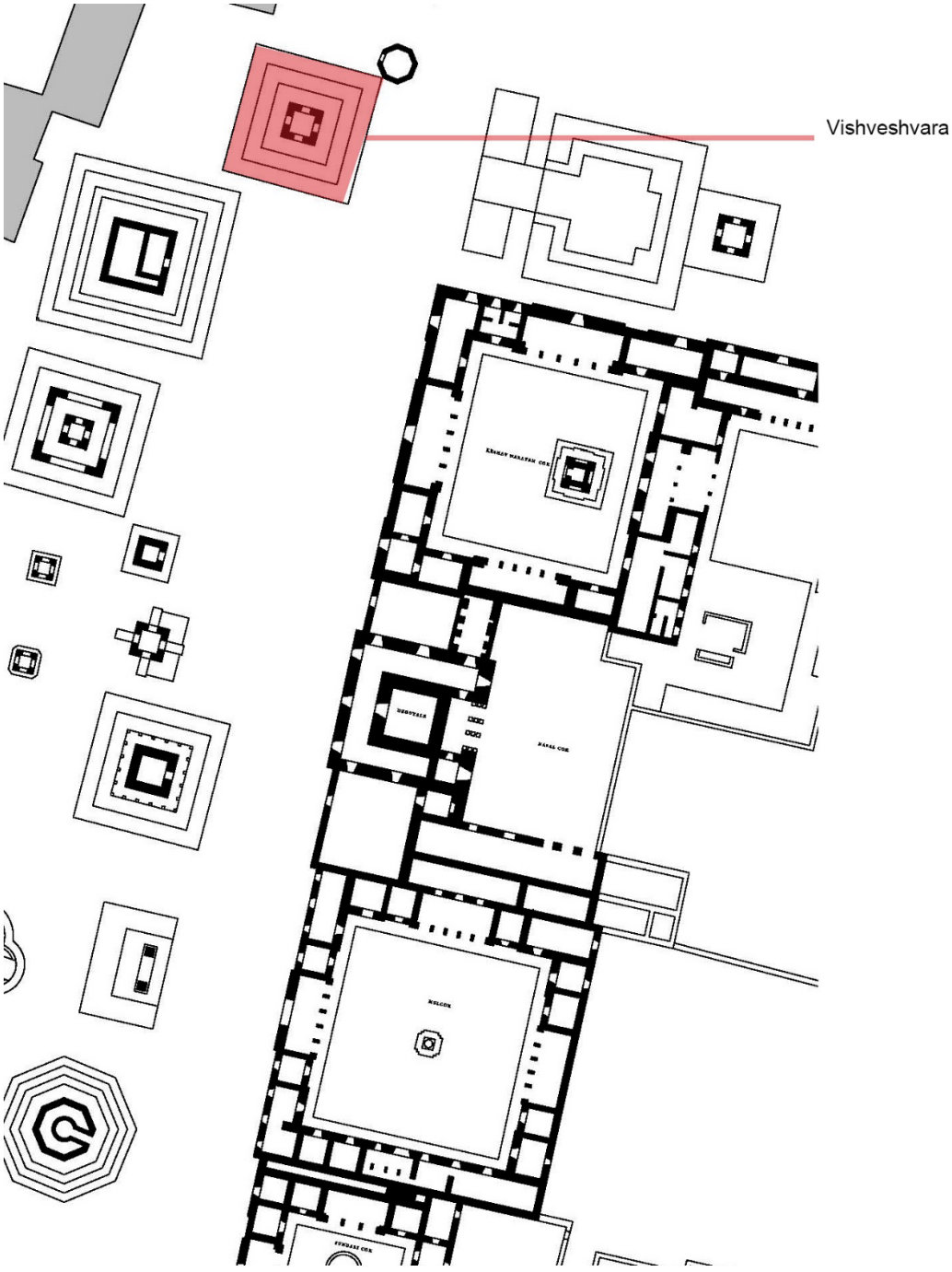
[A] List of all product / technical data sheets

[1] Detailed material characterisation - sandstone

[2] Detailed material characterisation - calcitic schist

Photo Credits

GENERAL INFORMATION		
Monument Vishveshvara temple base	**Orientation** -	**Size (H x L x W)** 8 x 8 m
Date of Production 1627		**Location** North Darbar Square
Date of the last Treatment Conservation 2018-2019		**Institutions of the last Treatment** IoC



Condition Assessment		
Date of Evaluation May 2024		**Evaluation done by** Martina Haselberger Sarah Moyschewitz
Recent Damages:		
☐ Stability Problems ☒ Not detected	☐ Major ☐ Medium ☐ Minor	No stability problems could be identified by visual inspection.
Comment:		
☐ Broken / - into several Pieces ☒ Not detected	☐ Many ☐ Some ☐ Few	
Comment:		
☐ Lose / Missing Parts ☒ Not detected	☐ Many ☐ Some ☐ Few	
Comment:		
☒ Joints ☐ Not detected	☒ Open	☐ Many ☐ Some ☒ Few — Particularly thin joints (Fig. 1)
	☒ Cracked	☐ Many ☒ Some — Often at border to stone (Fig. 2) ☐ Few
Comment:		
☒ Scaling, Sanding or Powdering ☐ Not detected	☐ Major ☐ Medium ☒ Minor	Some sandstone blocks show losses, probably immanent to the type of stone, mostly on the east side. Loss on sandstone block on north side (arm), recent?

		Sandstone blocks on west side show flaking /scaling, and detachment of black crusts.
Comment:		
☐ Biological Colonization ☒ Not detected	☐ Microbiological Growth	☐ Major ☐Medium ☐ Minor
	☐ Mosses	☐ Major ☐Medium ☐ Minor
	☐ Higher Plants	☐ Major ☐Medium ☐ Minor
Comment:		
☒ Mechanical Damage ☐ Not detected	☐ Abrasion	☐ Major ☐Medium ☐ Minor
	☒ Other	☐ Major ☐Medium ☒ Minor — Lost piece on sandstone block under the cornice on the east side (human?)
Comment:		
☐ Salt Deterioration ☒ Not detected	☐ Efflorescence	☐ Major ☐Medium ☐ Minor
	☐ Subflorescense	☐ Major ☐Medium ☐ Minor
Comment:		
☒ Soiling	☒ Heavy	Dust, dirt, pigeon droppings, chewing gum, tikka; all surfaces seem greasy

☐ Not detected	☐ Medium	
	☐ Light	
Comment:		
☒ Other	Comment:	crack through block on west side

Evaluation of the Condition

☐ good (no need for treatment)

☒ satisfactory (some minor treatments necessary)

☐ unsatisfactory (major conservation measures necessary)

Conclusion

In general, joint mortar is in good condition: stable and not sanding

Heavy soiling is present, which renders retouching after conservation pointless

Some schist blocks show delamination

Sandstone blocks with scaling particularly threatened by mechanical damage (people putting their feet on the stone when sitting on them)

PHOTO DOCUMENTATION

Condition at Evaluation Date

Fig. 1: Thin open joint.

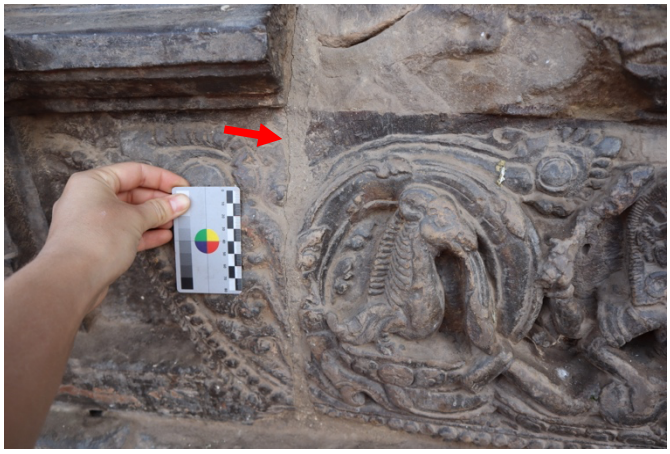


Fig. 2: Joint cracked along the edge.

Fig. 3: Templebase, north.

Picture missing

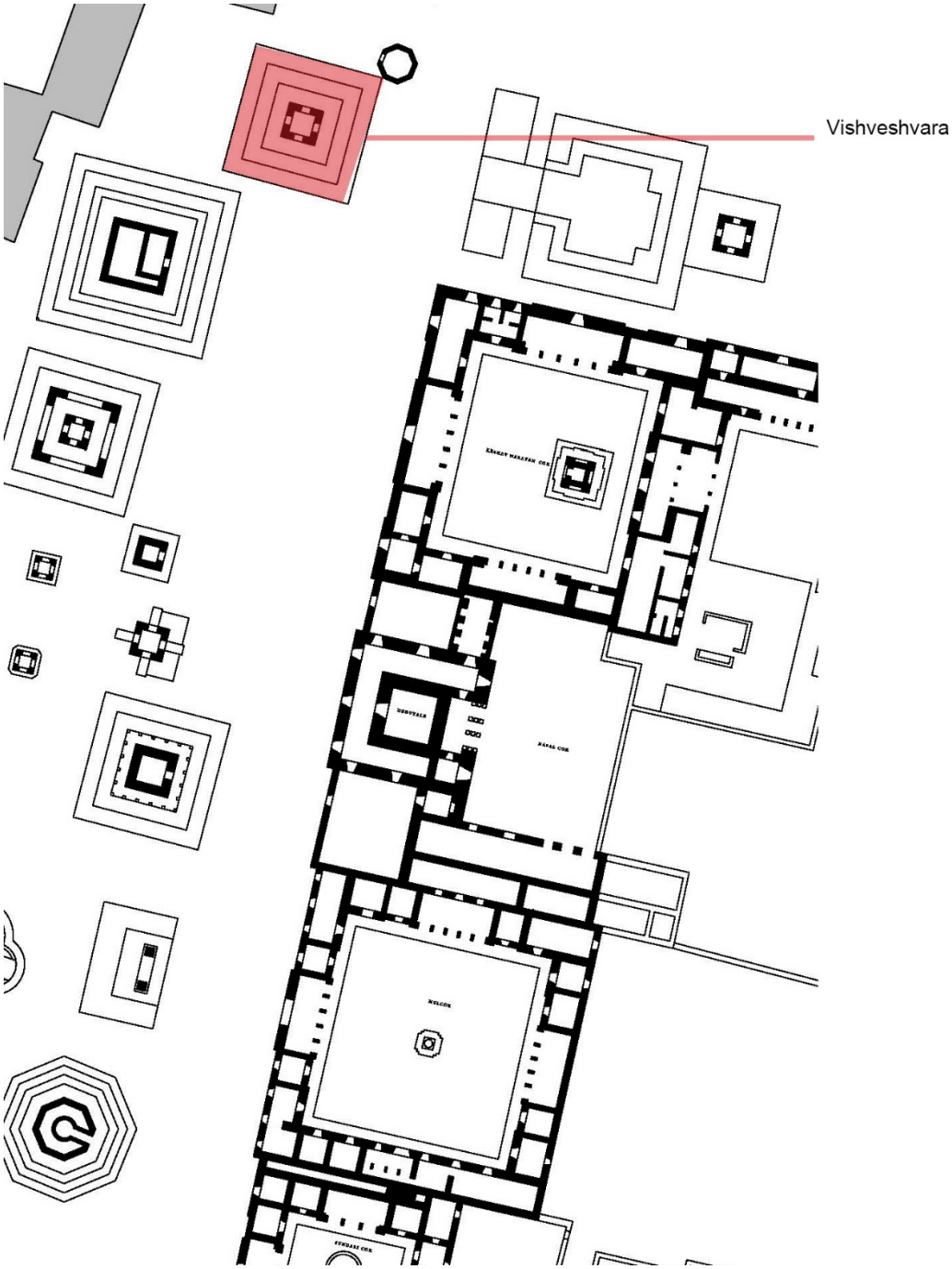
Fig. 4: Templebase, east.

Fig. 5: Templebase, south.

Fig. 6: Templebase, west.

Picture missing

GENERAL INFORMATION		
Monument Vishveshvara Temple Elephants	**Orientation** -	**Size (H x L x W)** -
Date of Production 1627	**Location** North Darbar Square	
Date of the last Treatment Conservation 2018, 2019	**Institutions of the last Treatment** IoC	



Condition Assessment		
Date of Evaluation May 2024	**Evaluation done by** Martina Haselberger Sarah Moyschewitz	
Recent Damages:		
☐ Stability Problems ☒Not detected	☐ Major ☐ Medium ☐ Minor	
Comment:		
☐ Broken / - into several Pieces ☒Not detected	☐ Many ☐ Some ☐ Few	
Comment:		
☒ Lose / Missing Parts ☐Not detected	☐ Many ☐ Some ☒ Few	Small loss of stone on the left foot of the right (north) elephant
Comment:		
☒ Joints ☐Not detected	☒ Open ☒ Cracked	☐ Many ☐ Some ☒ Few ☐ Many ☐ Some ☒ Few — Few cracks were found at the joint's edges (Fig. 6 and 7)
Comment:		
☒ Scaling, Sanding or Powdering ☐Not detected	☐ Major ☐ Medium ☒ Minor	Scaling from the dark crust. Scaling on the left foot of the right elephant and under the head of the Elephants (Fig.12 and 13)

Comment:			
☒ Biological Colonization ☐Not detected	☒ Microbiological Growth	☐ Major	
		☒Medium	Present on joints, fillings and upper areas where water is allowed to accumulate, as well as on the heads of the elephants (Fig. 14 and 15)
		☐ Minor	
	☒ Mosses	☐ Major	
		☒Medium	Same as “Microbiological Growth”
		☐ Minor	
	☐ Higher Plants	☐ Major	
		☐Medium	
		☐ Minor	
Comment:			
☒ Mechanical Damage ☐Not detected	☐ Abrasion	☐ Major	
		☐Medium	
		☐ Minor	
	☒ Other	☐ Major	
		☒Medium	Crack on trunk of left elephant due to expanding of corroding iron (Fig. 9-11)
		☒ Minor	Scratches (vandalism) on the side of the right elephant (Fig.16)
Comment:			
☐ Salt Deterioration ☒Not detected	☐ Efflorescence	☐ Major	
		☐Medium	
		☐ Minor	
	☐ Subflorescense	☐ Major	
		☐Medium	
		☐ Minor	
Comment:			

☒ Soiling	☐ Heavy	
☐Not detected	☒ Medium	Mostly on the top of the elephants and at the feet in depths of carvings (Fig.17)
	☐ Light	
Comment:		
□ Other	Comment:	

Evaluation of the Condition

☐ good (no need for treatment)

☒satisfactory (some minor treatments necessary)

☐ unsatisfactory (major conservation measures necessary)

Conclusion

The Joint mortar is sanding in many areas, but not washed out and mostly still in place (does microbiological growth act as a protective layer and prevents surface erosion?), probably due to manufacturing errors.

Joint mortar shows increased biological colonization (moss, algae).

Iron pins inside the structure seem to be causing the formation of cracks and breakage.

PHOTO DOCUMENTATION

Condition at Evaluation Date

Figure 1: Both elephants from the front.

Figure 3: Right elephant (North), inside.

Figure 2: Right elephant (North), Outside.

Figure 4: Left elephant (South), outside.

Figure 5: Left elephant (South), inside.

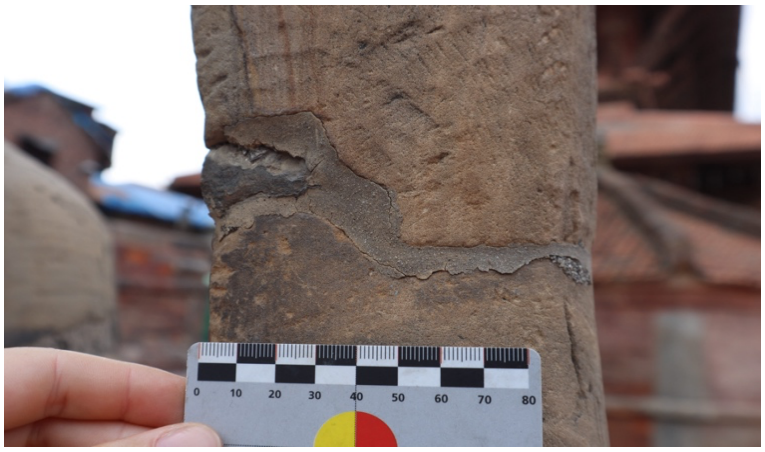


Figure 6: Joints cracked along the edge to the stone.

Figure 7: Crack at the border of the joint.

Figure 8: Crack, glued piece at the left elephants trunk.

Figure 9: Crack at the backside of the trunk of the right elephant, recent?

Figure 10: Same crack as shown before (right elephant, trunk from the side).

Figure 11: Right elephant, crack from the trunk is running further in the Man under his foot.

Figure 12: Scaling, exemplary.

Figure 13: Crusts and scaling at the underside of the left elephant, maybe due to water.

Figure 6: Microbiology on the joints.

Figure 15: Microbiology on the head of an elephant.

Figure 16: Scratches, exemplary.

Figure 17: Soiling.

[A] Product Data Sheets – Links[1] to Suppliers/Manufacturers

AEROSIL® 200
https://products.evonik.com/assets/or/ld/AEROSIL_200_TDS_DE_DE_TDS_PV_52043839_de_DE_WORLD.pdf

Aviva Silikat Grundierung
https://www.adler-lacke.com/Canto/tmb/aviva-silikat-grundierung_tmb_4079_de.pdfA
Alkylbenzyldimethylammonium chloride
https://www.sigmaaldrich.com/AT/en/sds/mm/8.14858?userType=anonymous

Klucel™ EF
https://www.kremer-pigmente.com/elements/resources/products/files/63701-63713.pdf

Aviva Tirokat-Color, Adler
https://www.adler-lacke.com/Canto/tmb/aviva-tirokat-color_tmb_4087_de.pdf

Mixtion Le Franc, Kremer
https://shop.kremerpigments.com/elements/resources/products/files/98000e.pdf

Waxes, Deffner und Johann
https://deffner-johann.de/media/datasheets/4186000/EN/Zusatzinformation_Wachse_DE_DJ.PDF

Injection mortar HFX
https://productdata.hilti.com/APQ_HC_RAW/ASSET_DOC_7567931.pdf

Kölner Classic Ölmixtion 3h; 12h; 24h
https://www.kolner-vergolderprodukte.de/produkte/koelner-oelmixtion/

KSE 500 E
https://media.remmers.com/celum/export/documents/Remmers_0715_KSE-500-E-_Technisches-Merkblatt_de_DE_26355.pdf

Lascaux 498 20 X acrylic adhesive
https://deffner-johann.de/media/datasheets/2051100/DE/2051100_Technisches%20Datenblatt_Lascaux%20Acrylkleber%20498%2020%20X_DE_DJ.pdf

Marble dust
https://www.kremer-pigmente.com/elements/resources/products/files/58500-58580_59001-59690.pdf

Natural hydraulic lime
https://www.preservationworks.us/wp-content/uploads/2019/10/NHL-Datasheet-Lafarge-23.5.pdf

Plextol B-500 (acrylic dispersion)
https://deffner-johann.de/media/datasheets/2556500/DE/2556500_Technical%20Data%20Sheet_Acrylic%20Dispersion%20B%20500_EN_DJ.pdf

Primal® SF 016
https://deffner-johann.de/media/datasheets/2543001/DE/2543001_Technical_Data_Sheet_Primal_SF_016_DJ_EN.pdf

AKEPOX® 2010
https://data.akemi.de/fileadmin/user_upload/products/productdocuments/TMB/Akepox_2010_TMB_D.pdf

[1] All links were last accessed on 13 May 2025.

EPO-TEK® 301-1
https://www.epotek.com/docs/en/Datasheet/301-1.pdf

Titebond Wood Glue
http://sds.franklini.com/msds/1411.042k0nmo0020.pdf

Paraloid™ B-72, Kremer
https://www.kremer-pigmente.com/elements/resources/products/files/67400-67409.pdf

Keim Granital®
https://www.keim.com/documents/de-AT/723/TM_Granital_DE-AT.pdf

[1]“Sandstone”	
Visual characteristics	- Fine and homogenous grain structure - Whitish to ochre colour
Samples taken (sample names and origin)	- **KAT2**, (Leiner 2010) Bhandarkhal Tank Pavilion Base (Fig. 3, 4) - **KRP Original** (Fuchs 2013), Stone Gate, Patan Darbar Square (Fig. 5–9) Cross and thin sections of the samples were prepared and examined with light microscopy and SEM. **Sources**: Leiner, Susanne. 2010. “Der Pavillon am Bhandarkhal-Tank. Palastkomplex Patan, Nepal.” Pre-thesis, University of Applied Arts Vienna. Fuchs, Katharina. 2013. “Bitumen Coating on Stone, a Nepalese Problem? The Conservation of Two Stone Relief Gates at the Nasal Chowk, Patan Royal Palace.” Pre-thesis, University of Applied Arts Vienna.
Petrographic/geological characterization	- quartz sandstone ("arkose" sandstone) - rich in feldspar - silica grains angular, interlocked and covered by layers of iron oxides/hydroxides and clay - clayey binder (contains mostly sheet silicates) - different amounts of iron-compounds with sheet structure - fine grained with average grain size of 50 µm, coarse grain fraction with 250 µm
Physical properties	- varying porosity but in general highly porous, 20–25% porosity (Leiner 2010, S. 62), intergranular porosity - capillary active - varying colours and weathering behaviour due to different clay and iron content - homogenous structure with some bedding - relatively soft
Use at Patan Darbar Square	Scientifically confirmed: - Stone Gates - Bhandarkhal Tank By visual inspection only: - Harishankara temple base - Vishveshvara temple base and elephants - Krishna Mandir - Tusha Hiti - Mul Chowk Lions
Origin of material	- unknown

Fig. 1: Visual inspection of the sandstone from Bhandarkhal Tank Pavilion Base, © IoC 2010.

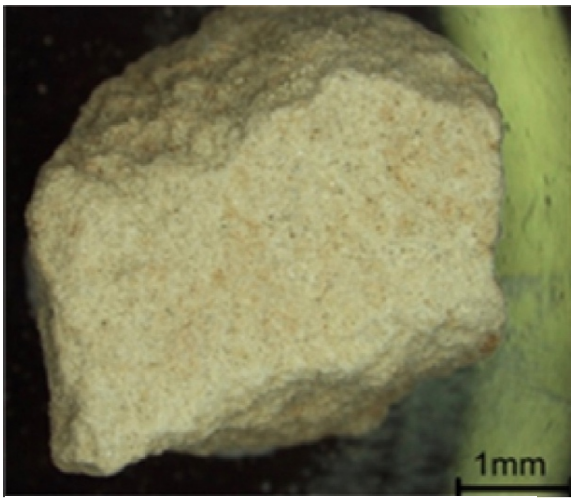


Fig. 2: Visual inspection of the sandstone from Bhandarkhal Tank Pavilion Base, © IoC 2010.

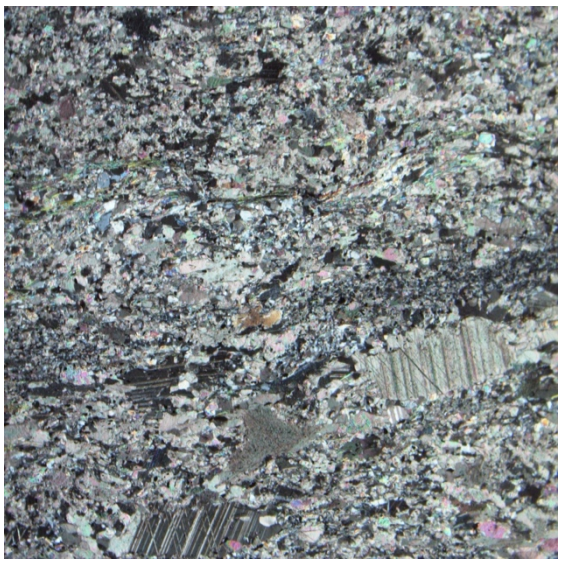


Fig. 3: Sample KAT2, thin section, optical microscopy, polarized light, x24.

Fig. 4: Sample KAT2, thin section, optical microscopy, transmitted light, x24.

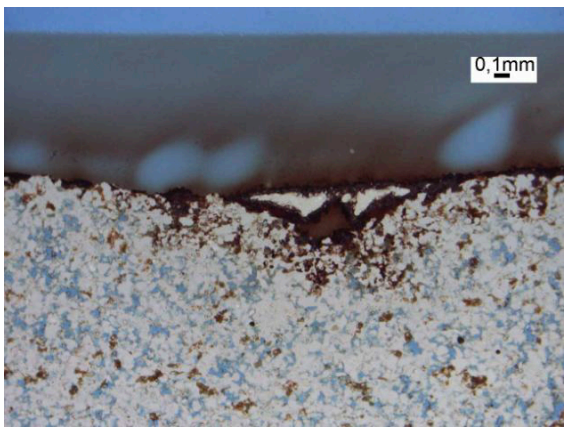


Fig. 5: Sample KRP Original, polished thin section, stereo microscope (Nikon SMZ 1500), reflected light, polarized light. The sample shows stone with bitumen coating.

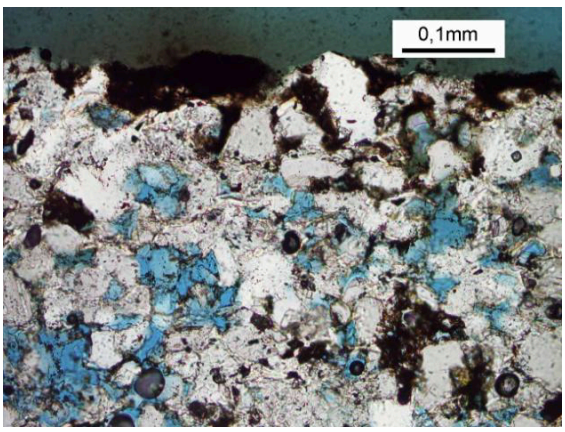


Fig. 6: Sample KRP Original, polished thin section, stereo microscope (Nikon SMZ 1500), reflected light, polarized light. The sample shows stone with bitumen coating.

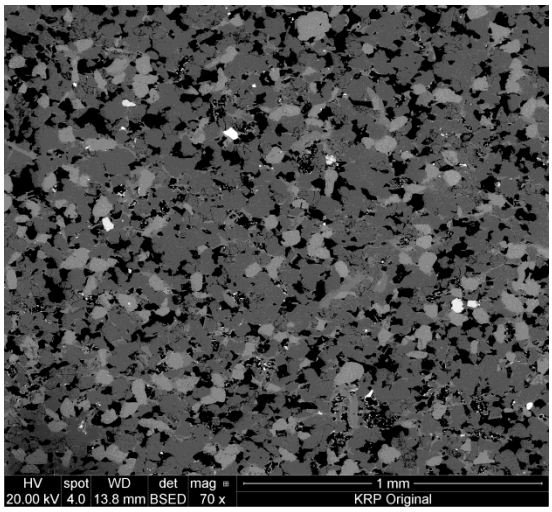


Fig. 7: Sample KRP Original, SEM; description: black = pores, dark grey = quartz, light grey = feldspar, white spots= Fe-(hydr)oxides.

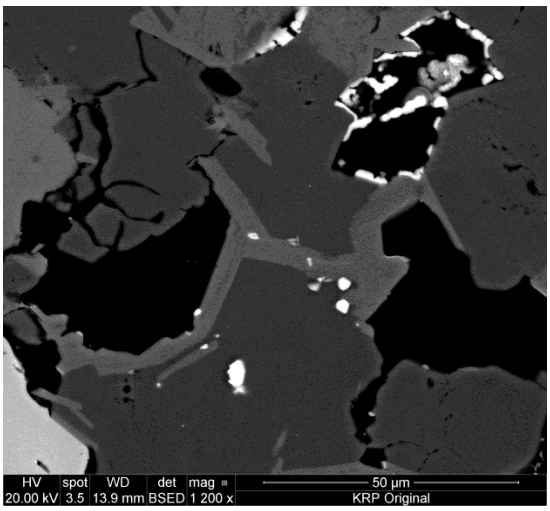


Fig. 8: Sample KRP Original, SEM; description: black = pores, dark grey = quartz, light grey = feldspar, white spots= Fe-(hydr)oxides.

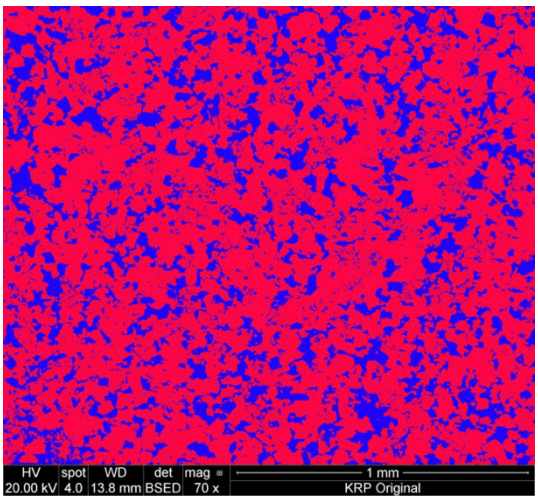


Fig. 9: Sample KRP Original, SEM photo of thin section in false colours (red = grains, blue = pores).

[2]“Calcitic schist”

Description of visual characteristics	- light grey to almost black colour - occasional white inclusions with reddish center - characteristic schist surface with homogeneous foliation and inclusions
Samples taken (sample name and origin)	- **KAT1** (Leiner 2010), Bhandarkhal Tank Pavilion Base (upper covering) (Fig. 3, 4) - **P06, P07** (Kaipf 2017), Yoganarendra Pillar (Fig. 5–16) - **NEP_ST_1** (Haselberger/Fuchs 2023), loose material around Royal Garden workshop (Fig. 17–22) Cross and thin sections of the samples were prepared and examined with light microscopy and SEM. **Sources**: Leiner, Susanne. 2010. “Der Pavillon am Bhandarkhal-Tank. Palastkomplex Patan, Nepal.” Pre-thesis, University of Applied Arts Vienna. Kaipf, Luis. 2017. “The Pillar of Yoganarendra Malla. Condition Survey, Conservation Treatment and Re-erection.” Pre-thesis, University of Applied Arts Vienna. Johannes Weber, Katharina Fuchs, Martina Haselberger. 2023. Scientific investigation of the stone sample NEP_ST_1 from Patan Royal Garden Workshop. Unpublished report, Institute of Conservation, University of Applied Arts Vienna.
Petrographic/geological characterization	- weakly metamorphic schist, predominantly calcareous - high concentration of silicates arranged in foliations, surrounded by a very fine-grained siliceous marble - homogenous matrix and slight banding - average grain size of major calcite crystals between 0.03–0.05 mm; 0.05–0.25mm for silicate crystals - minor components of Phlogopite mica (grain size 0.1–0.2mm) - grain borders linear or curved - analyzed sample displays shear zone of ore minerals or graphite
Pyhsical properties	- relatively dense and heavy material - almost no water absorption
Damage patterns	- (hair) cracks and loss of material due to mechanical stress – probably stone intrinsic due to metamorphosis - almost no water related damage
	Scientifically confirmed: - Pillar Yoganarendra Malla - Bhandarkhal Tank Pavilion Base (upper covering)

Use at Patan Darbar Square:	By visual inspection only: - Lion Pillar - Garuda Pillar - Harishankara Temple Base (cornerstones with lion protomes, inner threshold) - Kings Throne - Stone Gates (inner profile) - Tusha Hiti - Visveshvara Temple Base (cornerstones with lion protomes, inner threshold)
Probable origin of material:	- Probably mined in the Kathmandu Valley – the alluvium filled Kathmandu Valley is bordered by a sequence of unmetamorphosed to slightly metamorphosed sedimentary rock in the east, south and west - Most probably from the southern part of the Kathmandu Valley, according to the geological map (Himalayan Maphouse [Ed.] Comprehensive Geological Map, GL701), possibly associated with the Chandragiri Formation. - According to the map, the stone from the Chandragiri Formation is defined as following: *"light fine grained crystalline limestones partly siliceaus thick to massively bedded white quartzites in upper parts. Wavy limestones contain late ordovician schinoderms."*

Fig. 1: Upper stone covering of Bhandarkhal Tank Pavilion Base, © IoC, 2010.

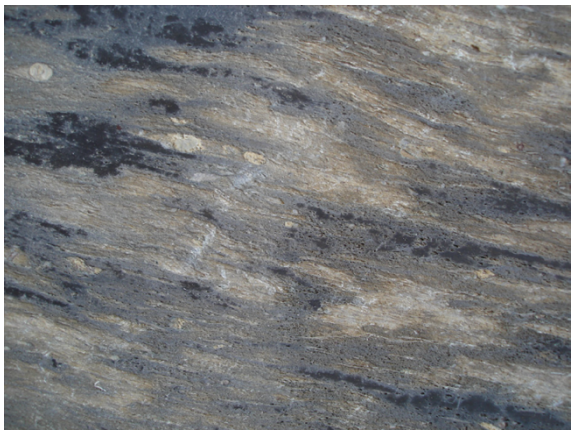


Fig. 2: Visual inspection of stone from Yoganarendra Malla Pillar, © IoC, Kaipf, 2017.

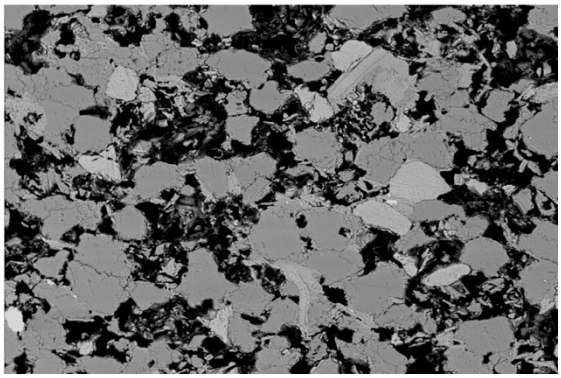


Fig. 3: Sample KAT1BS1, thin Section, SEM BSE.

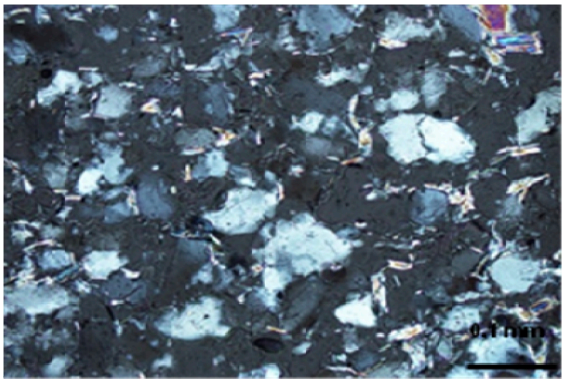


Fig. 4: Sample KAT1, thin section, optical microscopy, x200.

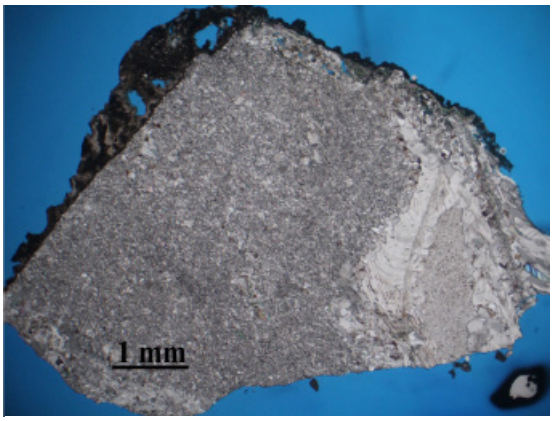


Fig. 5: Sample P06, thin section, optical microscopy, x24.

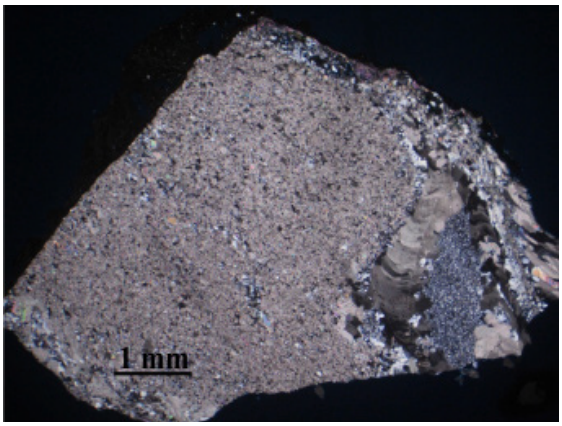


Fig. 6: Sample P06, thin section, optical microscopy, x24.

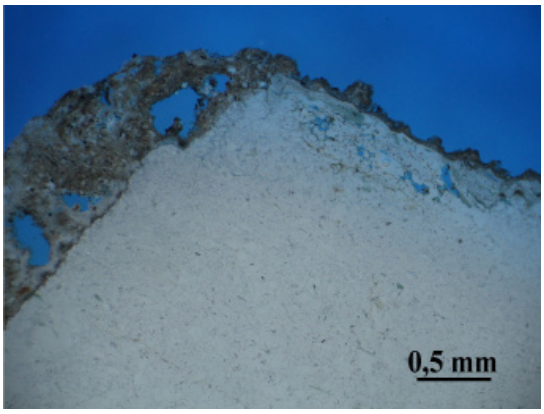


Fig. 7: Sample P06, thin section, optical microscopy, x48.

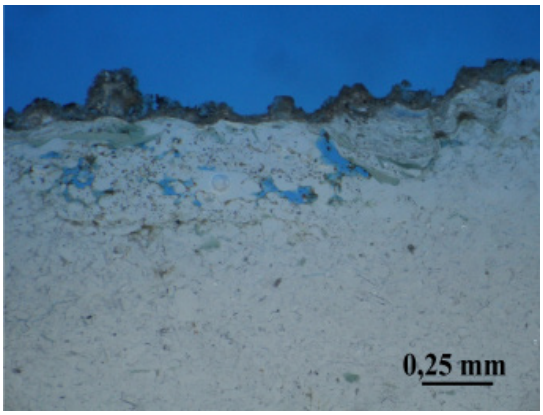


Fig. 8: Sample P06, thin section, optical microscopy, x48.

Fig. 9: Sample P07 taken in 2016, Lotus ring, Pillar of Yoganarendra Malla, Kaipf 2017.

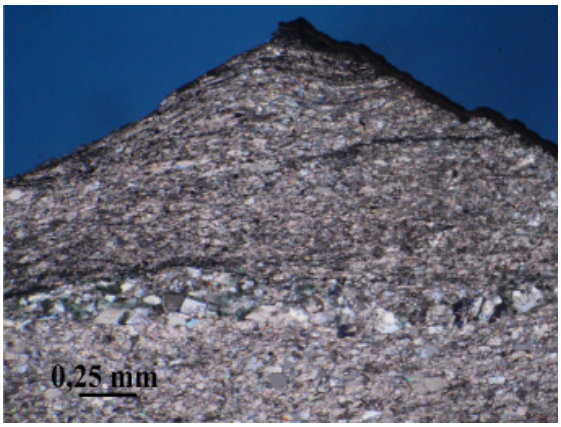


Fig. 10: Sample P07, thin section, x72. Fabric with relatively homogenous matrix and slightly developed banding.

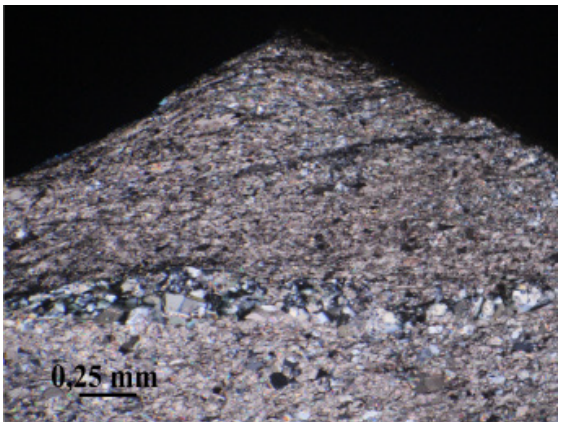


Fig. 11: Sample P07, thin section, x72.

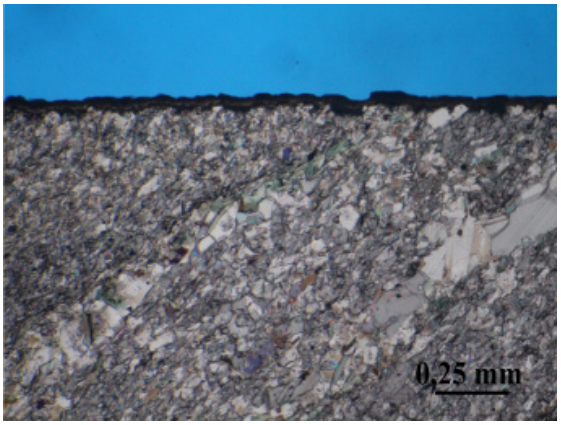


Fig. 12: Sample P07, thin section, x90.

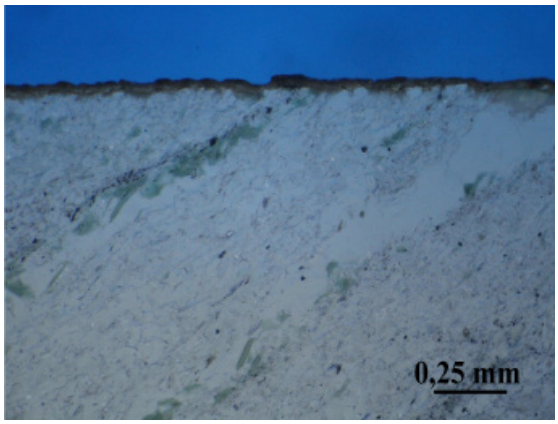


Fig. 13: Sample P07. thin section, x90.

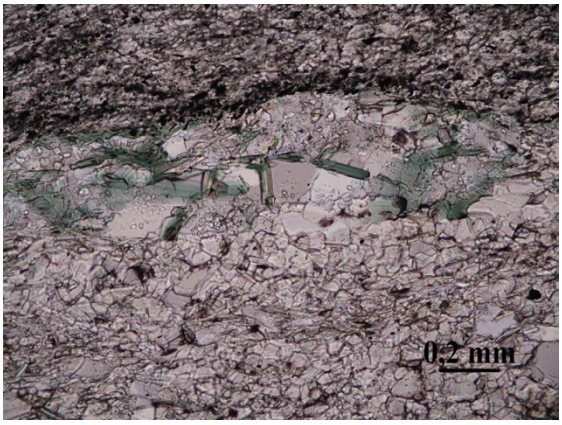


Fig. 14: Sample P07, thin section, x100; Phlogopite.

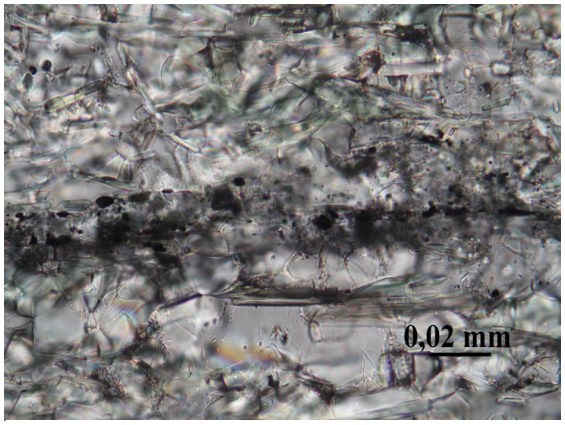


Fig. 15: Sample P07, thin section, x1000; Shear zone.

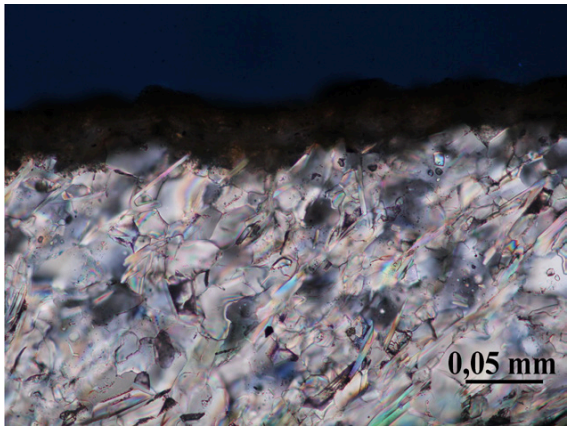


Fig. 16: Sample P07, thin section, x500. Equigranular grain aggregate with mainly polygonal grain forms.

Fig. 17: Sample NEP_ST_1.

Fig. 18: Sample NEP_ST_1.

Fig. 19: Sample NEP_ST_1, Nikon SMZ 500, transmitted light, crossed polarizers. Overview of the rock matrix with coarser and finer layers.

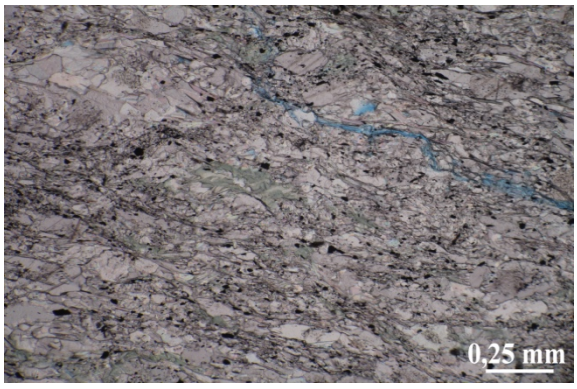


Fig. 20: Sample NEP_ST_1, Nikon SMZ 500, transmitted light, parallel polarizers. Detailed view of the matrix.

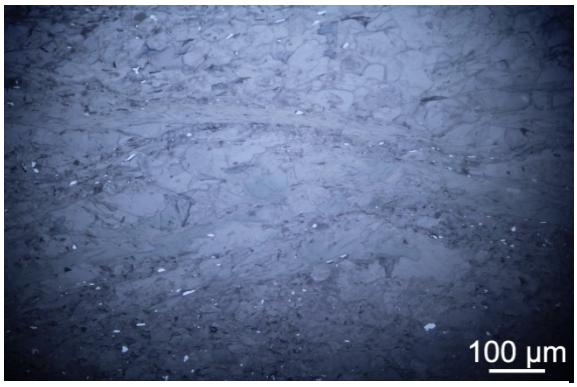


Fig. 21: Sample NEP_ST_1, Olympus BX40, incident light, bright field. Overview of mica inclusions (whitish spots).

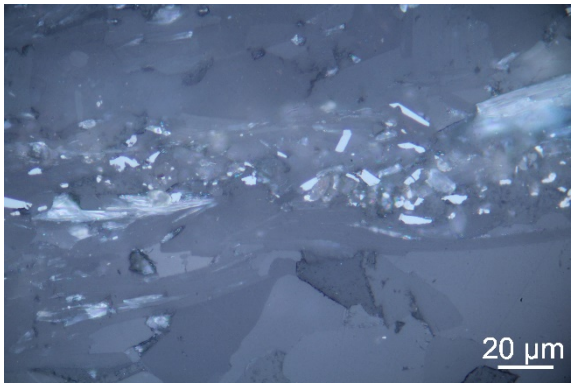


Fig. 22: Sample NEP_ST_1, Olympus BX40, incident light, bright field. Detail of a fine layer with mica flakes.