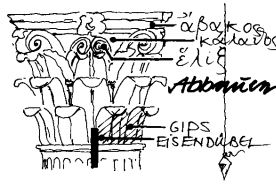


FOLDER OF REFERENCES



ancient dovetail clamp at the foundation of the market gate in miletus



Linzgaustraße 22
88690 Uhltingen, Germany
Fon: +49 7556-933780
Fax: +49 7556-9337820

Contacts:

Dipl. Ing. Johannes Pfanner
info@pfanner-baustatik.de

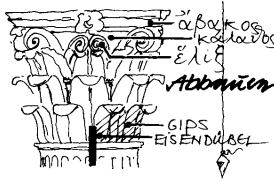
Prof. Dipl. Michael Pfanner
info@pfanner-gmbh.de

FOLDER OF REFERENCES

Summary

Selected Projects 1 - 23

Digital Folder of References CD



Linzgaustraße 22
88690 Uhldingen, Germany
Fon: +49 7556-933780
Fax: +49 7556-9337820

Contacts:
Dipl. Ing. Johannes Pfanner
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Prof. Dipl. Michael Pfanner
info@pfanner-gmbh.de

SUMMARY

The Pfanner Brothers working group (ARGE Pfanner) is specialised in the **restoration planning of historical buildings, monuments and sculptures** with the main focus on “stone”.

Their activities include in Germany the Neuschwanstein Castle, the Pergamon Museum in Berlin and the Victory Arch (Siegestor) in Munich, as well as projects in other countries like the Market Gate in Miletus / Turkey and the Titus Arch in Rome / Italy.

The working group consists of an **engineering bureau for building structural calculations**, managed by Johannes Pfanner, and a **restoration workshop** completed with an **architectural bureau**, managed by Michael Pfanner.

The ARGE engages about 40 employees and has assembled 30 years of experience.

Management of the ARGE Pfanner:

- ▶ **Johannes Pfanner**, born in 1961, originally trained as a carpenter but then completed studies in structural engineer (Dipl. Ing. (FH)).
- ▶ **Michael Pfanner**, born in 1955, is a trained sculptor and restorer. He completed studies in classical archaeology (Dr. of Phil.) and architecture (Dipl. Ing.). He is active as professor for archaeology at the university of Leipzig, Germany.

Project leader of the ARGE Pfanner:

- ▶ Andreas Jeggle, born in 1975, structural engineer (Dipl. Ing. (FH))
- ▶ Alexander Haage, born in 1968, structural engineer (Dipl. Ing. (FH))
- ▶ Liane Reichenbach, born in 1978, architect (Dipl. Ing.), building and construction researcher
- ▶ Wlodek Kowalski, born in 1966, certified restorer – specialized on stone (Dipl.)
- ▶ Zbyszek Winnicki, born in 1965, building-site manager and workshop manager

The **team** includes architects, archaeologists, architectural historians, art historians, certified restorers, scientists, engineers, stonemasons and sculptors.

The **performance spectrum** spans the range from building inspection with detailed drawings, surveying and mapping of damage, archive research, development of concepts, scientific investigations and structural calculations to sample restorations and development of substitute materials and mortars.

ARGE Pfanner has especially been engaged with monuments of the **Greek-Roman-Period** and has published several scientific articles concerning their restoration.
For further information also see <www.arge-pfanner.de>.

On the following pages several projects of the ARGE Pfanner of the last 30 years are shown.



ARGE PFANNER www.arge-pfanner.de

Project: Workshop Arge Pfanner
- impressions -

location: workshops in Munich and Scheffau
offices in Munich, Scheffau, Uhldingen
period: experience of 30 years



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workshop in Munich, reconstruction of an altar



adjustment of a stone
flour recipe

laboratory



restoration of sandstone acroterions





ARGE PFANNER www.arge-pfanner.de

Project: Titus Arch (1st century A.D.)
- building research -

location: Italy, Rome

period of execution: 1978 - 1988

task / measure: surveying und mapping, building research,
publication: M. Pfanner, Der Titusbogen (1983)

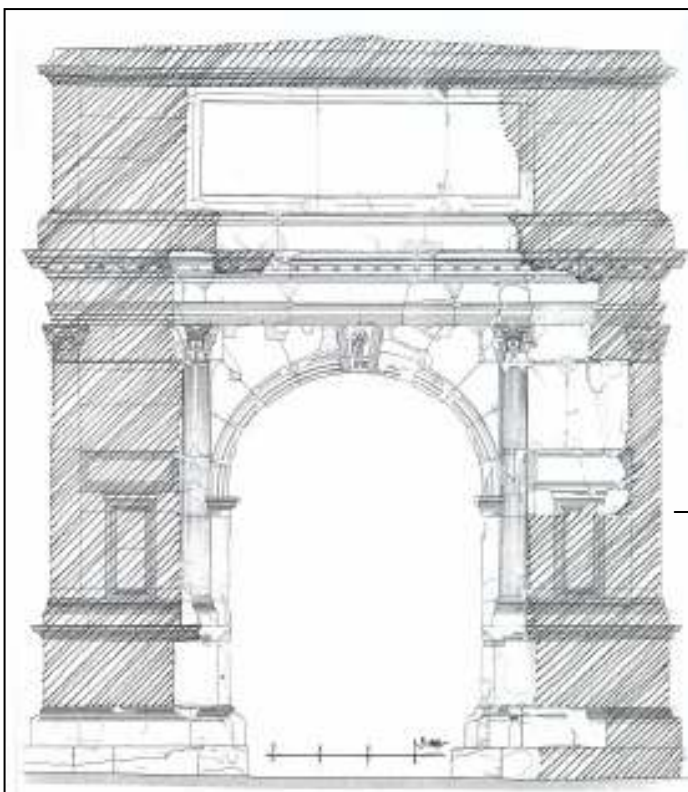
principal / co-operation partner: German Archaeological Institute (DAI),
Soprintendenza of Rome





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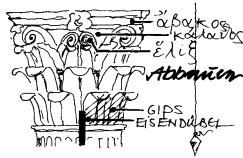


Titus Arch front view



mapping of different
stone material

-  marble (original)
-  travertine (restoration 19th century)



ARGE PFANNER www.arge-pfanner.de

Project: Market Gate of Miletus (2nd century B.C. – 2nd century A.D.) - building research -

location: Turkey, Miletus

period of execution: 2004 - current

task / measure: surveying und mapping, building research, publication

principal / co-operation partner: German Archaeological Institute (DAI),
foundation: Thyssen Stiftung, excavation: Deutsche Miletgrabung Bochum,
University of Leipzig, Museum of Antiquity in Berlin, University of Marburg



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different periods of the
agora of Miletus
(plan, Pfanner, 2004)

overview of the Market Gate area



surface analysis of the marble stone

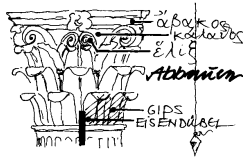


drilling cores of the ground survey



electronical surveying with tachymeter





ARGE PFANNER www.arge-pfanner.de

Project: Neuschwanstein Castle (19th century)
- façade restoration & static securing -

location: Germany, Füssen

period of execution: 2002 - 2006

task / measure: building subsistence - crack control, restoration of the façade, static securing

principal / co-operation partner: building state authority Kempten, federal state authority for monuments

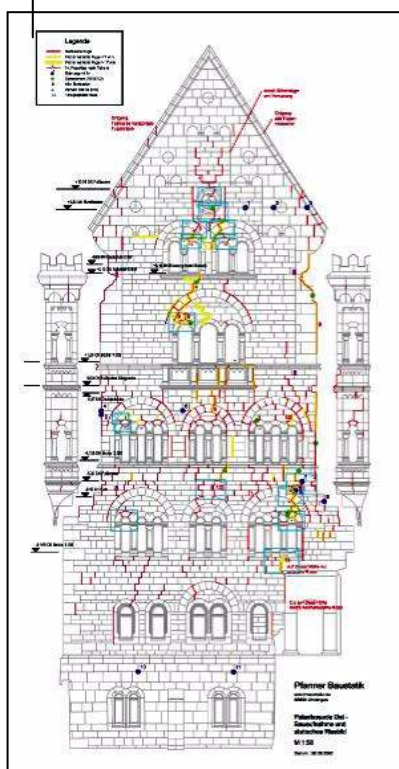


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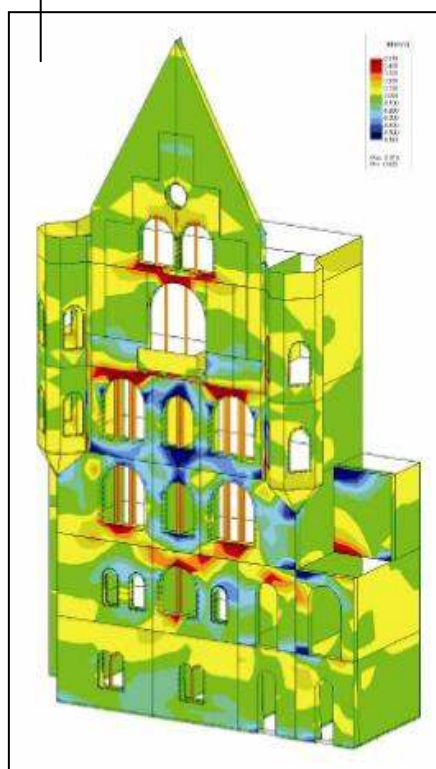


overview of
Neuschwanstein castle

CAD-mapping of
damages and cracks

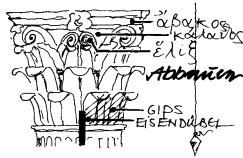


static analysis:
finite element method



crackmonitoring in the castle





ARGE PFANNER www.arge-pfanner.de

Project: Siegestor (19th century)
- restoration and static securing -

location: Germany, Munich

period of execution: 1995 - 1999

task / measure: overall refurbishment

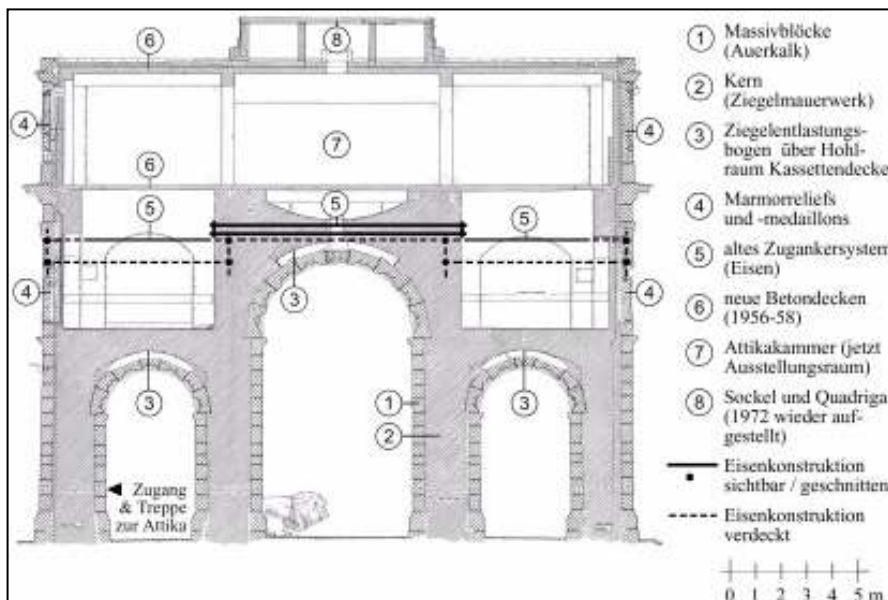
principal / co-operation partner: building authority (Baureferat) of Munich,
federal state authority for monuments



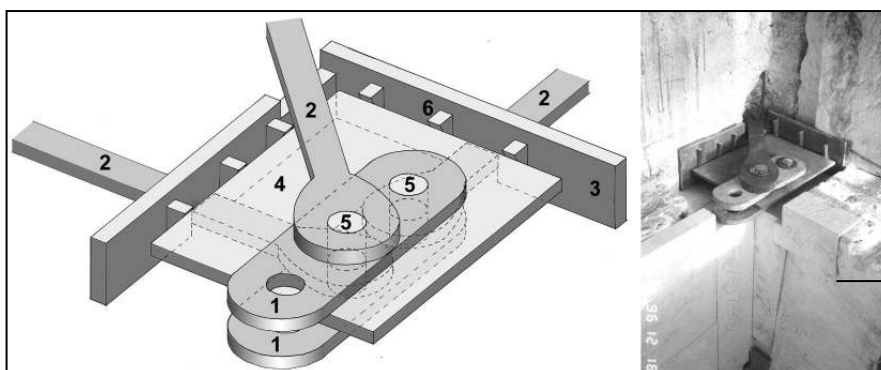
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front view of the Siegestor
after restoration



longitudinal section through
the Siegestor with projection
of the new tension system



construction of the new
crosspoint of stainless steel



ARGE PFANNER www.arge-pfanner.de

Project: Walhalla (19th century)
- limestone & substructure restoration -

location: Germany, Walhalla (close to Regensburg)

period of execution: 2006 - current

task / measure: restoration of the monumental staircase and acroterions

principal / co-operation partner: building state authority Regensburg



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overview of the Walhalla



recreation of the
substructure of
the grand staircase



restoration of
the acroterions



crack strengthening of
the limestone





ARGE PFANNER www.arge-pfanner.de

Project: Assyrian Bas-Reliefs of Nimrud (9th century B.C.)

- alabaster restoration -

location: Germany, Munich

period of execution: 2006 - current

task / measure: restoration planning and concept of restoration

principal / co-operation partner: Egypt Museum,

equalisation fund: Wittelsbacher Ausgleichsfond



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macro photograph of
the stone surface



1:1 copy for transport and
exhibition tests

Assyrian Bas-Relief of the King Assurnasirpal
height: 2,32 m, width: 1,46 m, thickness: 0,12 m



signs of ancient paintings...

...and its analysis in the laboratory
(Laboratory Prof. Schramm, Dresden)



probe 02; Querschliff QS 3629; 120-fache Vergrößerung (F03/05-11A)

Das Rot besteht aus zerkleinertem Hämatit (Fe_2O_3).
Den Gipsanteil der als Bindemittel fungiert, erkennt man in
Abb. 2 deutlich an der roten „Farbschicht“

Örtlichkeit und Text: Labor für naturwissenschaftliche Kunstuntersuchungen:
Prof. Dr. habil. H.P. Schramm – Dipl.-Ing. M. Schramm
D-81097 Dresden, Hauptstraße 25



ARGE PFANNER www.arge-pfanner.de

Project: Obelisk from Rome (1th century B.C.)
- granite restoration -

location: Germany, Munich

period of execution: 2006 - current

task / measure: restoration planning and concept; restoration

principal / co-operation partner: Egypt Museum,

equalisation fund: Wittelsbacher Ausgleichsfond



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obelisk, placed at the Hofgarten
in front of the Munich Residence



details of damages and former
restorations





ARGE PFANNER www.arge-pfanner.de

Project: Fortress of Burghausen (13th - 15th)
- tuff restoration -

location: Germany, Burghausen

period of execution: 2001 - 2003

task / measure: - restoration planning
- sample restoration in monumental halls
- on-site building inspection

principal / co-operation partner: building state authority Traunstein,
Bavarian Administration of State-owned Palaces, Gardens and Lakes,
federal state authority for monuments



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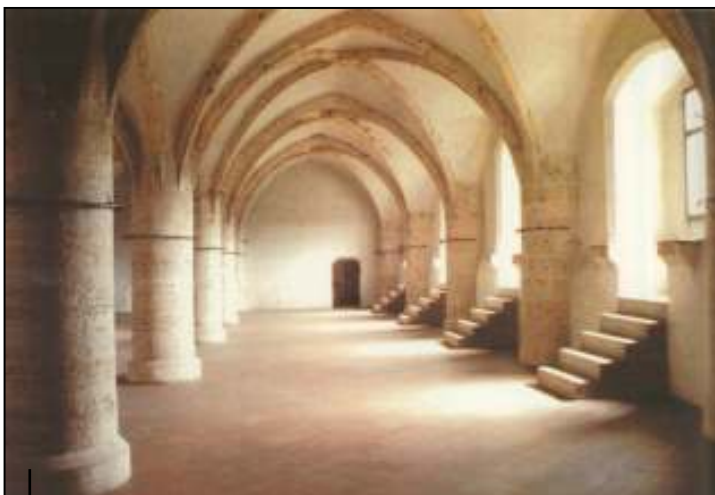
The fortress of Burghausen has a length of 1 km
and is the longest one in Europe.
View at the oldest part from the Salzach river



view from the back



analysis of particle-size distribution



view in one of the monument halls



pressure testing of stone supplement
material (Dr. Wendler, München)



ARGE PFANNER www.arge-pfanner.de

Project: Schleißheim Palace (17th century)

- static securing -

location: Germany, Schleißheim (close to Munich)

period of execution: 1998 - 2001

task / measure: - restoration planning of monumental staircases
- restoration of the grand cascade & the staircases

principal / co-operation partner: building state authority Munich;
Bavarian Administration of State-owned Palaces, Gardens and Lakes



copyright ARGE Pfanner 2007



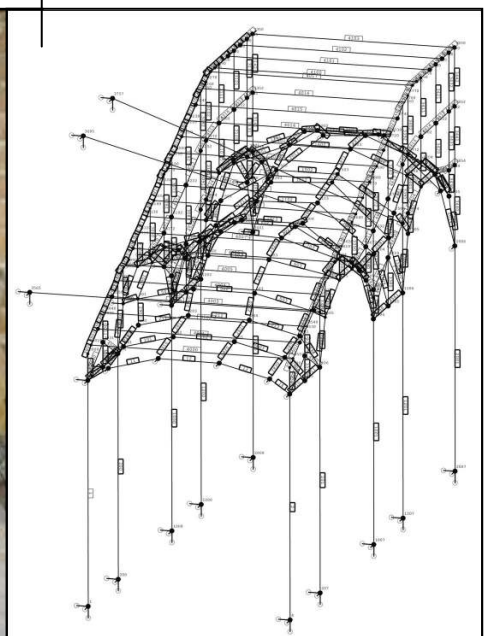
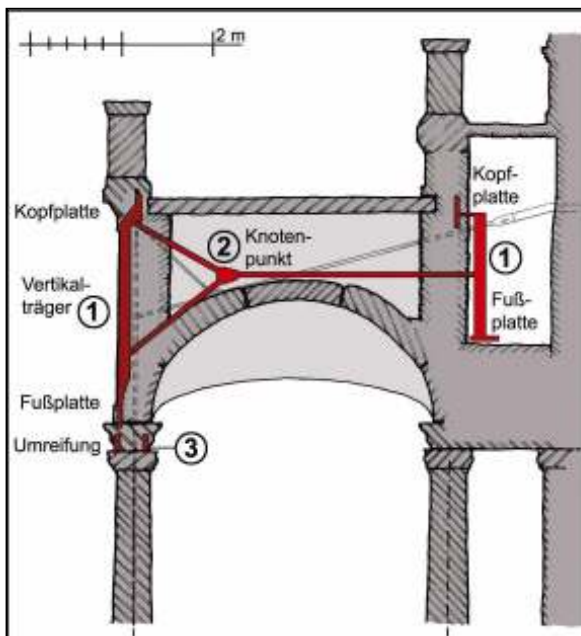
Schleißheim Palace



monumentary staircases in the entrance hall of the palace

new inside steel construction that secures the staircase arcades with a special relocation of tension and pressure forces

static model with force diagram





ARGE PFANNER www.arge-pfanner.de

Project: Nymphenburg Palace & Garden (17th century)

- lime and sandstone conservation -

location: Germany, Nymphenburg (close to Munich)

period of execution: 2002 - current

task / measure: - restoration planning of the monumental staircases,
bridges, cascades
- sample restoration and restoration of bridges and
cascades, figures and sculptures

principal / co-operation partner: building state authority Munich;
Bavarian Administration of State-owned Palaces, Gardens and Lakes,
equalisation fund: Wittelsbacher Ausgleichsfond



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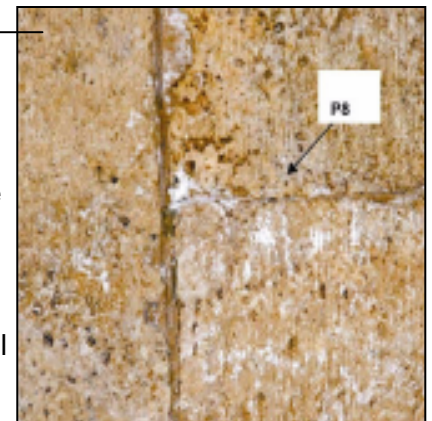


left: overview of Nymphenburg
right: central building of
Nymphenburg Palace with
the monumental staircase



salt
analysis
of the
staircase
(Dr. Seele
IGS)

monumental
staircase



88% Aphtitalit/Glaserit
6% Calcit
4% Quarz
2% Kainit



grand
cascade

fountain
sculpture:
putto
(cast)





ARGE PFANNER www.arge-pfanner.de

Project: Government of Bavaria (19th century)
- terracotta restoration -

location: Germany, Munich

period of execution : 1999 - current

task / measure: overall refurbishment of the historical terracotta and stone façade at a length of 200 m (one of the biggest world wide)

principal / co-operation partner: Government of Bavaria,
federal state authority for monuments



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part of the terracotta facade



partial strengthening of loose parts



detector tube "Karsten"



exhibition of different
restoration methods and
the recreation of new
terracotta-pieces

front view of the
government building





ARGE PFANNER www.arge-pfanner.de

Project: Junker-Jonas-Castle (16th century)
- static securing -

location: Austria, Götzis

period of execution: 2001 - 2003

task / measure: restoration planning & restoration of natural stone objects
(spiral staircase, structural ornaments, structural reveals)

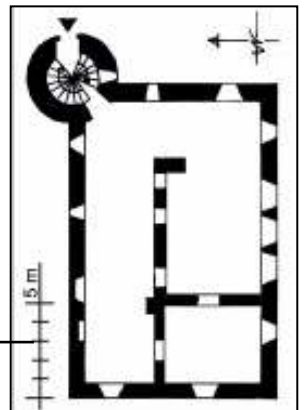
principal / co-operation partner: municipality Götzis,
federal state authority for monuments Bregenz



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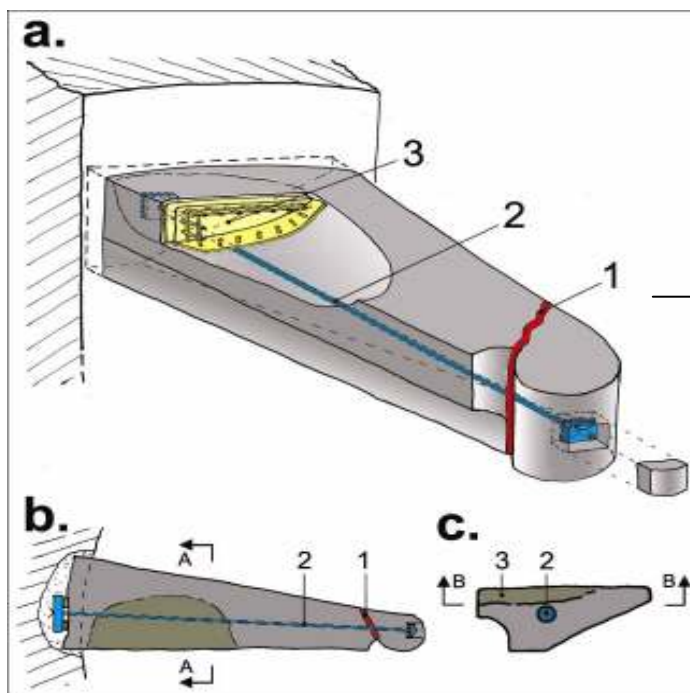
front view
with restored
sandstone reveals



ground plan
of the castle



spiral
sandstone
staircase
after
restoration



static securing of
the staircase step
with pressure and
tension forces

static
securing
of the spiral
staircase
during
restoration





ARGE PFANNER www.arge-pfanner.de

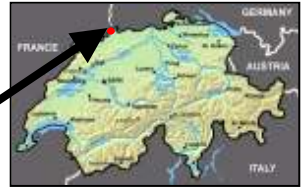
Project: Tomb H. La Roche (19th century) - conservation of marble stone-

location: Switzerland, Basle, cemetery: Wolfgottesacker

period of execution: 2004

task / measure: restoration planning and restoration of the marble tomb

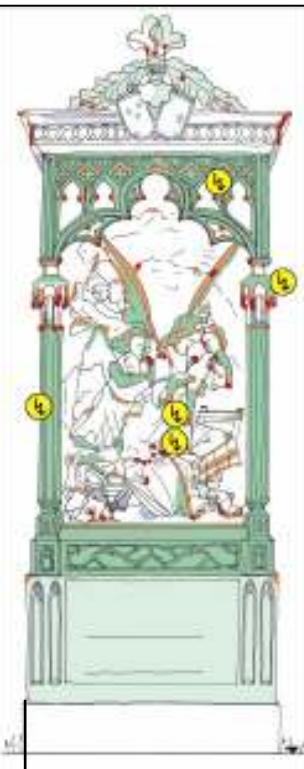
principal / co-operation partner: building department canton Basle, commission of memorial subvention, Munich Laboratory Dr. Ettl - Dr. Schuh



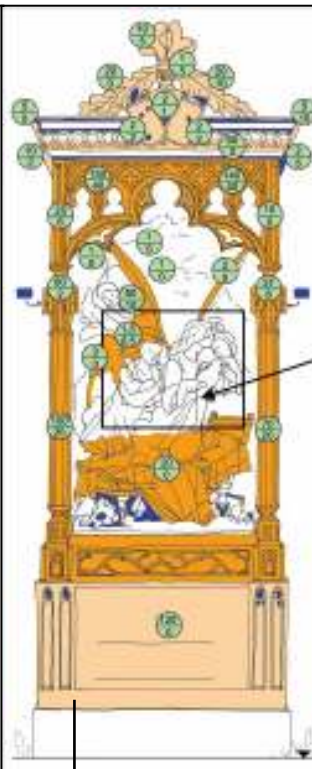
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front view



mapping of damages



mapping of parts of strengthening with indication of acrylate solution



MASSNAHMEN:

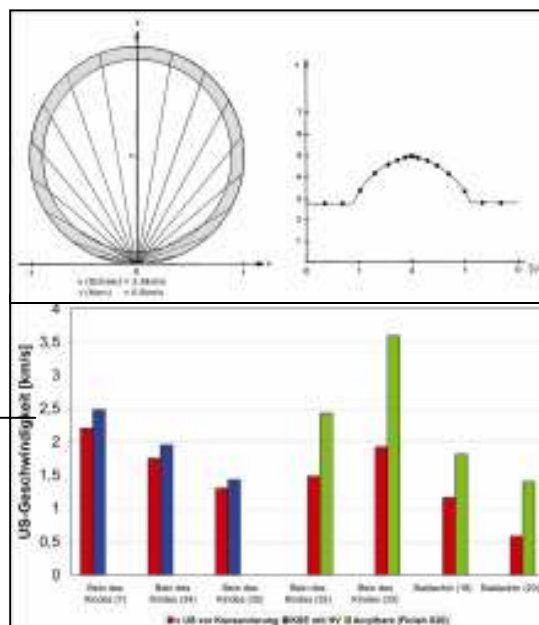
REINIGUNG

REINIGUNG: ENTFERNEN / ABSTRICHEN
allgemeine Reinigung mit Wasser, Sand,
pulver, Bürsten, weiche Bürsten, Schleif-
mittel, weiche Bürsten, Schleifmittel

VERFESTIGUNG

ACRYLAT

ACRYLAT: VERFESTIGUNG
GEBÄUDE: ACRYLAT (VON ALUMINUM) (VON ALUMINUM)
GEBÄUDE: ACRYLAT (VON ALUMINUM) (VON ALUMINUM)



ultrasonic measurements
and analysis of
different
strengthenings
(Dr. Ettl – Dr. Schuh)



ARGE PFANNER www.arge-pfanner.de

**Project: Patron Saints of the Cathedral
of Ottobeuren (18th century)**
- sandstone restoration -

location: Germany, Ottobeuren

period of execution: 2005 - 2006

task / measure: damage mapping, restoration concept, lift-off of the sculptures

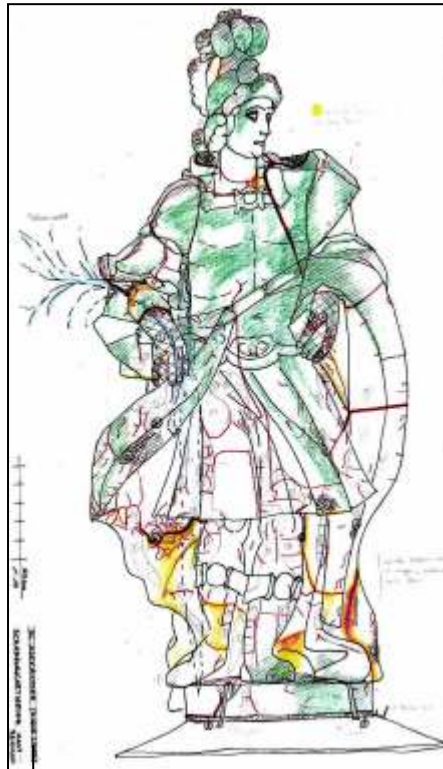
principal / co-operation partner: building state authority Kempten,
federal state authority for monuments, monastery Ottobeuren



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front view of Saint Theodor



damage mapping of
Saint Alexander



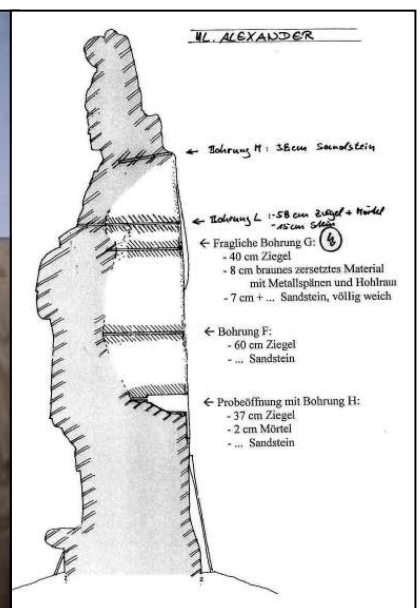
lift-off



surface and crack analysis



drilling cores and their positions (federal state authority for
monuments, Prof. Snethlage)





ARGE PFANNER www.arge-pfanner.de

Project: Museum of Antiquity Leipzig
(greek and roman objects)
- marble restoration -

location: Germany, Leipzig

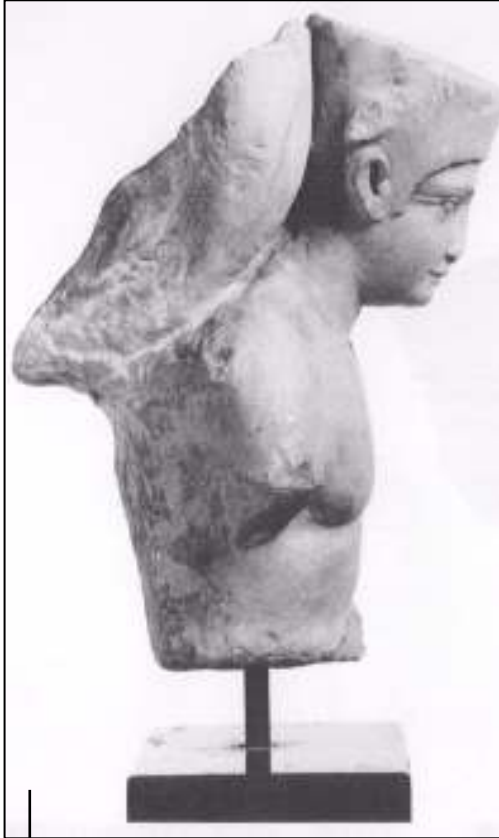
period of execution: 1999 - 2000

task / measure: restoration planning and restoration of Greek and Roman stone sculptures

principal / co-operation partner: University of Leipzig, Museum of Antiquity

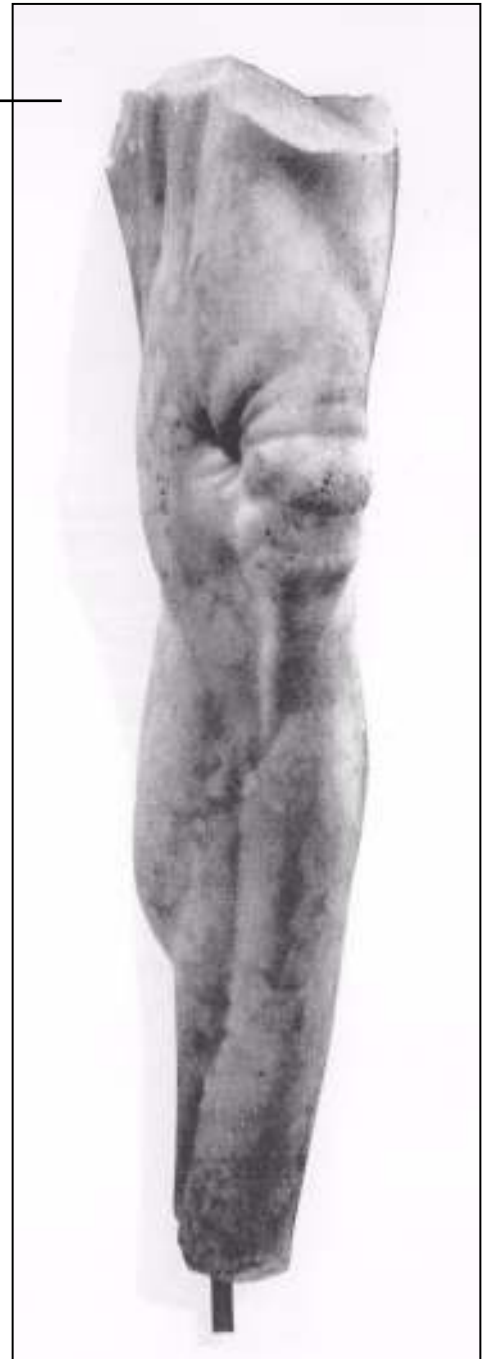


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fragment of a
table-pedestal

leg larger-than-life



head of Aphrodite
(4th century)



ARGE PFANNER www.arge-pfanner.de

Project: Carnuntum (1th - 4th century A.D.)
- restoration of roman altars -

location: Austria, Carnuntum (close to Vienna)

period of execution : 2001

task / measure: restoration planning and restoration of roman consecration altars, reliefs and inscriptions

principal / co-operation partner: archaeological park Carnuntum), federal state authority of the Lower Austria (Prof. Jobst)



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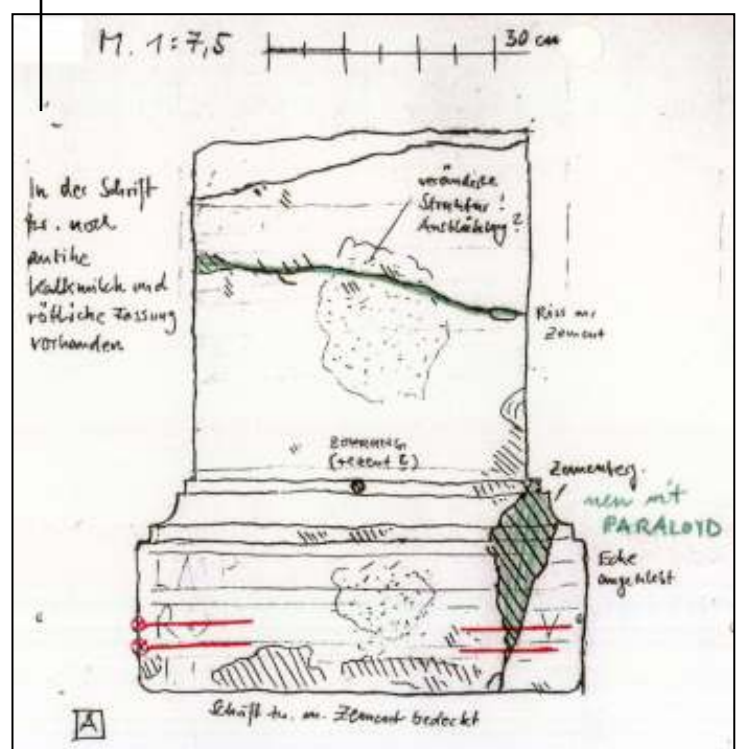


view of the different altars in Carnuntum

altar / base after restoration



mapping of damages and restoration actions





ARGE PFANNER www.arge-pfanner.de

Project: Pergamon Museum (20th century)
- inspection and presenting concept -

location: Germany, Berlin

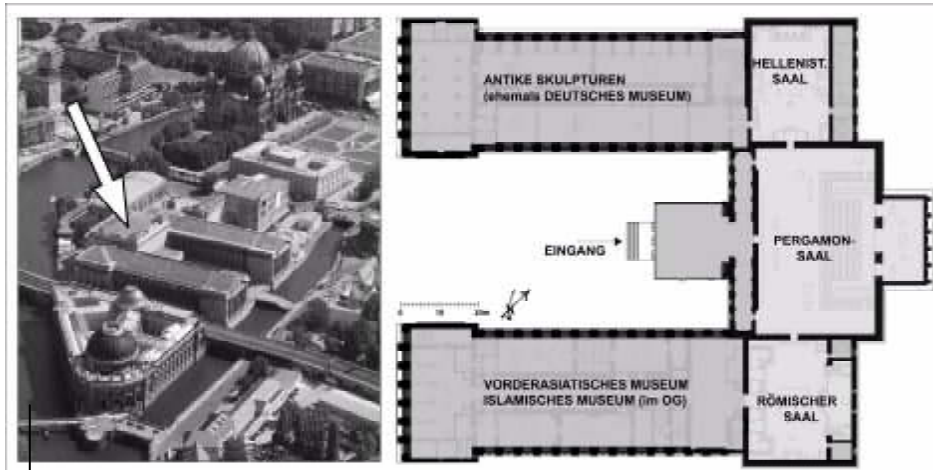
period of execution: 2002 - 2006

task / measure: - ancient halls: expertise of the condition of the presented monuments, damage mapping, restoration concept, restoration planning, sample restoration
- averting the danger of the monuments

principal / co-operation partner: foundation: Preußischer Kulturbesitz, Museum of Antiquity Berlin



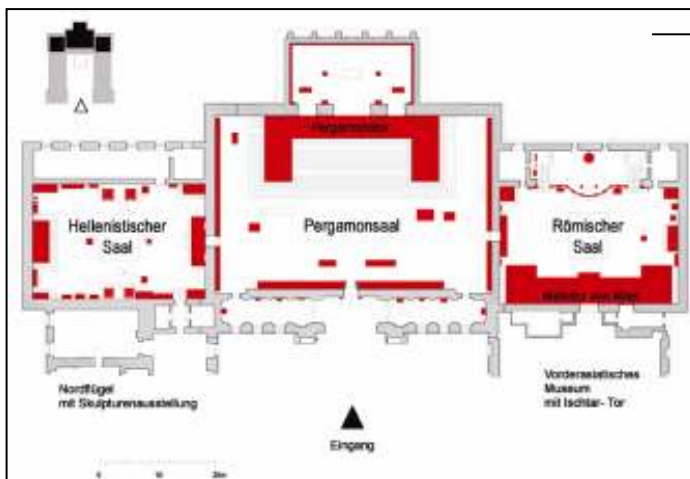
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overview of the "Museum Isle" and ground plan of Pergamon Museum



front view



ground plan of the ancient halls



view in the Hellenistic Hall (left), Pergamon Hall (centre), Milet Hall (right)



ARGE PFANNER www.arge-pfanner.de

Project: Market Gate of Miletus (2nd century B.C. – 2nd century A.D.)

- marble restoration -

location: Germany, Berlin, Pergamon Museum

period of execution: 2002 - 2006

task / measure: - damage mapping, restoration concept and planning,
sample restoration

- averting the danger, on-site building inspection

principal / co-operation partner: foundation: Preußischer Kulturbesitz,
Museum of Antiquity Berlin



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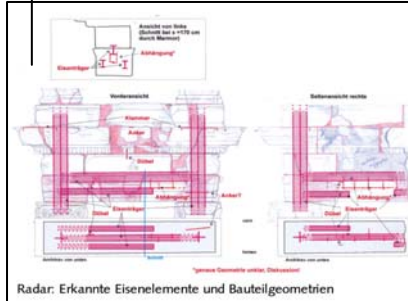
front view



war damage

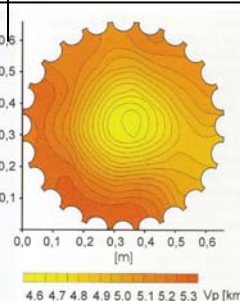
various analysis methods:

radar analysis



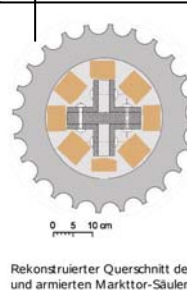
Radat: Erkannte Eiselemente und Bauteilgeometrien

ultrasonic measuring



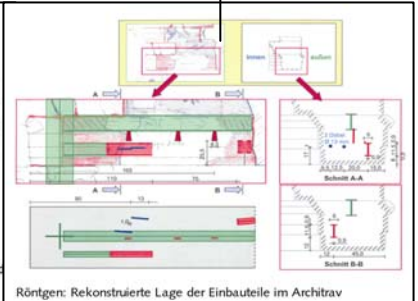
4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 Vp [km]

endoscope analysis



Rekonstruierter Querschnitt der d und armierten Marktör-Säulen

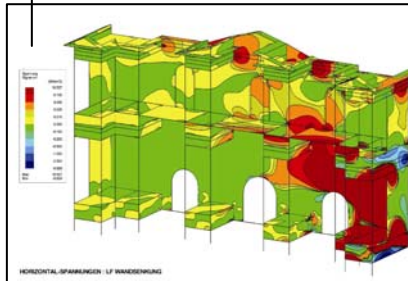
X-ray analysis



Röntgen: Rekonstruierte Lage der Einbauteile im Architrav

systems

finite element method

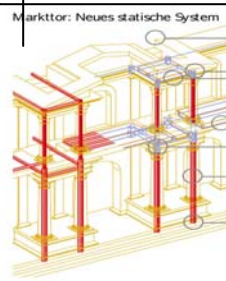


HORIZONTALSPANNUNGEN - LF WANDERUNG

3-D-modeling: steel system

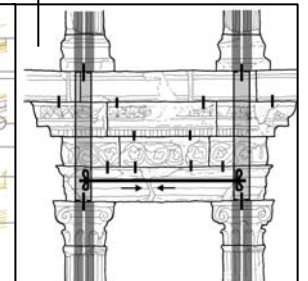


new system



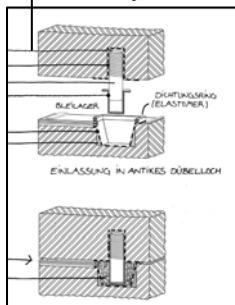
Marktör: Neues statische System

new system

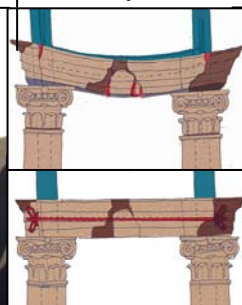


restoration samples

dowel system



anchor system



3-D-modeling, Gate in Miletus





ARGE PFANNER www.arge-pfanner.de

Project: Zeus-Sosipolis-Temple of Magnesia
(3rd – 2nd century B.C)

- static securing -

location: Germany, Berlin, Pergamon Museum

period of execution: 2002 - 2006

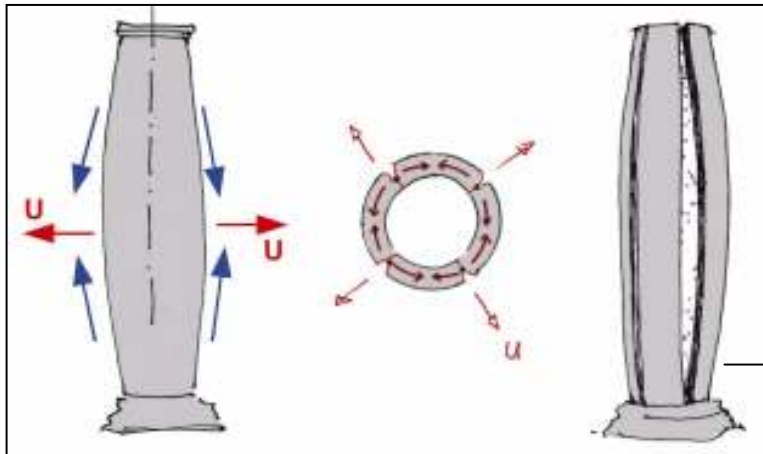
task / measure: - damage mapping, restoration concept and planning,
sample restoration

- averting the danger, on-site building inspection

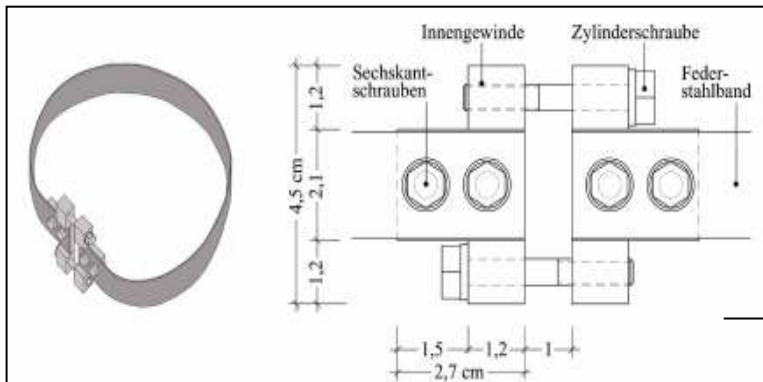
principal / co-operation partner: foundation: Preußischer Kulturbesitz,
Museum of Antiquity Berlin



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damages of the columns

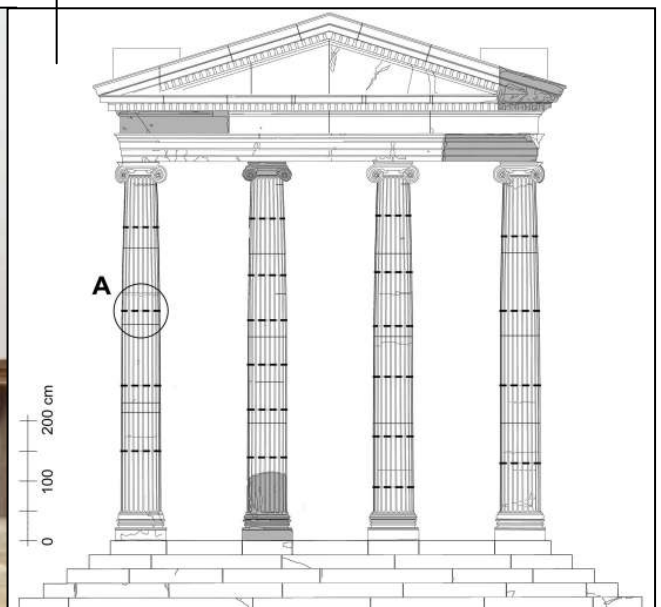


new belt of stainless steel

front view of the temple



drawing with the additional static system





ARGE PFANNER www.arge-pfanner.de

Project: Orpheus Mosaic (2nd century A.D.)
- restoration concept -

location: Germany, Berlin, New Museum

period of execution: 2002 - 2006

task / measure: - damage mapping, restoration concept and planning
- dismantling and relocation, sample restoration

principal / co-operation partner: foundation: Preußischer Kulturbesitz, Museum of Antiquity Berlin, federal state authority for monuments



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Orpheus Mosaic

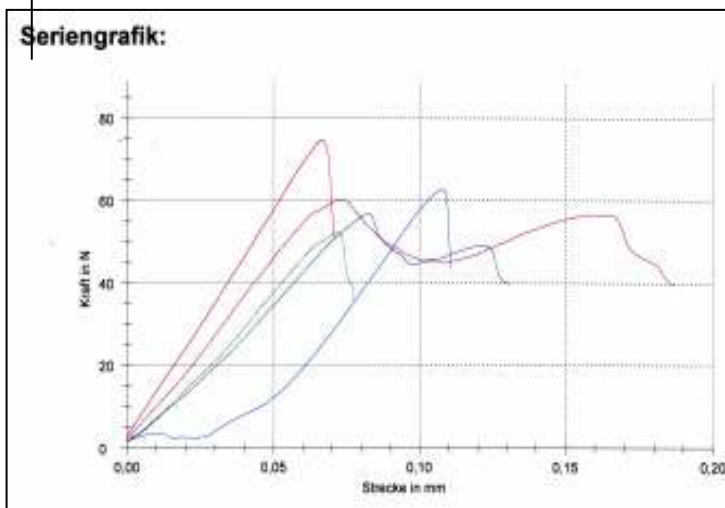
measurements:
surface temperature



crack monitoring



testing pressure (federal state authority for monuments):
diagram



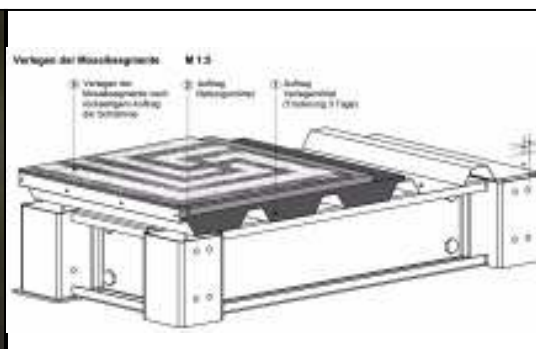
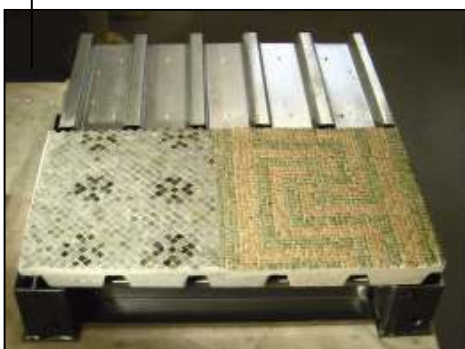
samples



testing machine



restoration concept: parting the mosaic in segments and sections:
sample construction



plan of segments





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Project: Repositories (roman and creek)
- inspection and restoration concept -

location: Germany, Berlin, Pergamon Museum

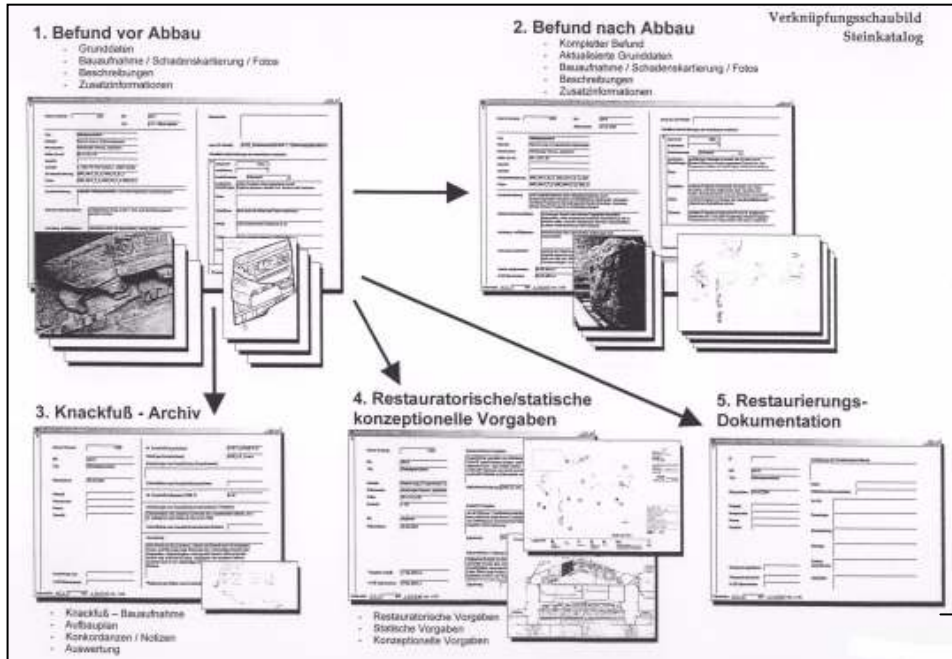
period of execution: 2002 - 2006

task / measure: - expertise of the condition, damage mapping,
development of a database, sample restoration

principal / co-operation partner: foundation: Preußischer Kulturbesitz,
Museum of Antiquity Berlin



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entries in a database

view in a architecture repository



view in a sculpture repository



All pieces in the repositories – that are about 20.000 sculptures and parts of architecture - have been inventoried, inspected for damages and registered in a database (“museum plus”).