Inscribed Stele Takeo 045

Conservation Report

Material: Green/gray sandstone, primarily composed of quartz, feldspars and rock fragments with a secondary calcite cement. Immature Triassic sandstone with a 'greywacke' typology as evidenced by larger rock fragments observed throughout.

Collection: Musée de Takeo
Date of entry : 13/07/2017

Provenance: Phum Po Khat, Khum Preah Bat Choan, Sruk Kirivong, Takeo

Location: Stone Conservation Workshop, National Museum of Cambodia, Phnom Penh

Date/style: Angkorian

Number of pieces: 1

Dimensions (cm): 99.5 x 53 x 8.5 cm (with concrete base), 93 x 34 x 8 (without concrete base)

Observations

Stele in grey sandstone, inscribed on one side (hereafter side A), in the shape of a "sima".

Structure : Although the structure is whole, approximately 1/3 of face A has suffered a superficial loss, including part of the inscription. This is best described as contour scaling, in which a layer of stone approximately 2.5 mm thick has lifted from the surface and detached. A gap measuring between 2-5 mm exists between the outer layer of stone and the bulk. There is a second, smaller area of loss of the surface layer at the bottom left of face A. A vertical crack associated with this lost layer extends upward along the edge of the stele, approximately 9 cm from the top of the loss.

A similar lifting of the outer stone layer is observed on side B, though not as extreme. The lifted layers are thinner, measuring approx. 1mm. Three areas of smaller losses are noted in an annotated condition map. These areas appear similar to a blister.

A vertical crack measuring approximately 15 cm is present on the proper left side of the stele.

The contour scaling is now believed to be stable (non-active), but the lifted layers may be vulnerable to damage if pressure is applied.

Surface : The stele is made from a light grey sandstone. Scratches, gouges and marks exist on the surface throughout, but are particularly concentrated around the lower portion of the stele. The bottom portion of the stele is more weathered and the inscription is less clear.

Interventions : The stele was cleaned with water and placed on a concrete pedestal for support. In May 2018, the space behind the lifted stone surface was cleaned mechanically and dry material existing within the gap was removed. A sample of this material was analyzed by Christian Fischer (UCLA) and found to contain primarily soil.

Two samples of stone were removed from the stele for analysis. One sample was removed from side B, around the blistering area at the top left. A second sample was taken from the bottom of the tenon. These samples were analyzed by C. Fischer (UCLA) using XRF, UV/VIS/NIR Spectroscopy and XRD, but were too weathered to be representative of the original stone.

July 2018
Following material testing (see below), a bulked ethyl silicate grout formulation was chosen for treatment of scaling areas on the reverse. A 4:2:1 ratio of fine sandstone powder : fine sand : Fillite ceramic microballoons (obtained from ceramics conservation workshop) was prepared to mix with Remmer's KSE 500 STE.

Small blister, reverse :
Approximately 2 scoops of dry material was added to ~10 mL of KSE 500 STE and mixed thoroughly. The mixture was introduced into the space behind the lifted stone using a spatula. The spatula was also used to push the material further into the areas behind the stone, to ensure that all gaps were completely filled. Some staining/darkening around the blister was observed, and the surface was cleaned successively with cotton swabs dampened with Remmer's solvent for KSE in an attempt to reduce darkening. Due to the vertical orientation of the stele, and the low viscosity of the grout, multiple steps were needed to ensure the grout filled the gapped areas. After lower portions of the gap were filled, and allowed to set for approx. 20 hours, the stele was reoriented so that upper and side portions of the gap could be filled (see photos). For upper and side layers, the outer layer of stone had not lifted as much as the lower portion, and access with a spatula was difficult. For these areas, a more fluid formulation (still including some bulking material) was injected into the gaps with a syringe. Tapping the surface of the stone from the outside aided in allowing the material to flow deeper into the gaps.

Large blister, reverse :
A very fluid mixture of KSE 500 STE + 4:2:1 sandstone : sand : ceramic microballoon was prepared for injection. Approximately 60-70 mL of this mixture was injected into the blister using a plastic IV attachment (6 syringes-full each holding 10-12 mL). After the last syringe injection, it was noticed that consolidant was leaking out of a crack at the bottom left of the stele. A paper towel compress was made to cover the crack, adhered with masking tape. The surrounding areas that were stained were cleaned several times with KSE solvent. The paper towel compress was removed and wet clay was pushed in to the crack.
The next day, additional cleaning of the area around the crack was performed. In removing the (now slightly hardened) clay from the bottom of the crack, it was discovered that the liquid was still pooled towards the bottom, and continues to flow out. This area was again plugged with clay. Surrounding areas (now discolored from both consolidant and clay) were cleaned mechanically with a spatula & scalpel, followed by KSE solvent applied with a stiff toothbrush.

Filling cracks :
Additional cracks on the sides of the stele were filled prior to backfilling any further gaps in order to prevent outflow of consolidant/grout. A mortar/paste was prepared by mixing KSE 500 STE with the 4:2:1 sandstone : sand : ceramic microballoon powder mixture. This paste was applied with a spatula, and pushed deep within the cracks using dental tools. Cracks on the bottom left side closer to the inscription and bottom right side (closer to the reverse) were filled in this way. Excess material was cleaned from the surrounding areas mechanically, followed by cotton swabs dampened with Remmer's solvent.

Continued treatment of large blister, reverse (week of June 30-Aug 3) :
The stele was tilted approximately 45 degrees to the left. A fluid mixture of KSE 500 STE + 4:2:1 sandstone : sand : ceramic microballoons was prepared. The mixture was injected into the gap, using a flexible plastic attachment for the syringe. Approximately 35 mL of the mixture was injected to begin. A thin, flexible jewelry saw blade was inserted into the gap behind the lifted stone in order to drive the material further. A slightly thicker mixture of the grout was prepared, which could not pass through the thin opening in the syringe attachment. Instead of injection, a small spatula was used to apply the grout. The jewelry blade was used throughout to drive the material deep within the gap. The mixture was applied until the gap appeared to be full (material had pooled at the top and could not be pushed in any further). The stele was left to sit for ~2 days, until it seemed that most of the liquid had set.

Front of Stele
The stele was tilted approximately 20 degrees, in order to flow the ethyl silicate/powder mixture into the slightly lifted area, running vertically on the left side. Because the gap in this area was so small, a very liquid mixture of 500 + powder was used. Material was added slowly and allowed to settle down into the gap. In between applications, the surface was cleaned with Remmer's solvent.

August 2018
A small core stone sample was taken from the bottom of tenon, approximately 2 cm deep. This sample of unweathered stone was taken to UCLA for petrographic analysis.

Photography:
NMC-EFEO digital: P717005, PC50671-60708