

# Penn Museum

University of Pennsylvania Museum  
of Archaeology and Anthropology

**ACCESSION NO:** E15729

**SECTION:** Egyptian

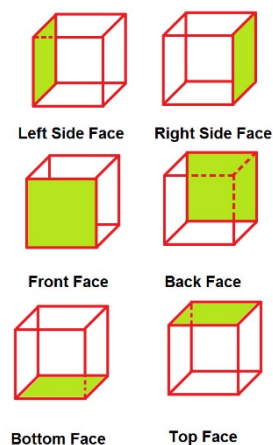
**OBJECT:** Kaipure Tomb Chapel (East and South walls).



# CONSERVATION RECORD

## DESCRIPTION:

This report describes the condition and treatment of blocks from the east and south walls of the Kaipure tomb chapel. The numbers used in this report are those identified on the Egyptian Department reference drawing (see attached East wall block map multimedia file). Reference to left and right sides of the blocks assumes that it is the viewer's left and right, as when someone stands looking at the front surface (see attached cube diagram multimedia file).



- Provenience: Saqqara, Egypt.
- Time period: Old Kingdom, Fifth dynasty-Sixth dynasty (2500-2170 BCE).
- The chapel is composed of approximately 93 blocks of limestone (count is dependent on how fragments are considered). The West wall was dismantled in 1996 for a travelling exhibition and is currently in storage. The South and East walls (61 blocks total, not including fragments) were dismantled in 2015 and are stored in the Lower Egypt (Sphinx) gallery. This conservation report concerns the South and East walls.
- Materials: Limestone, pigments in unknown binder, various mortars.
- The surface of the blocks are decorated with sculpted reliefs, painted with white, black, blue, green, red and yellow colors. The reliefs present funeral scenes, including boats on the Nile escorting Kaipure from the land of the living to the land of the dead, food gifts to the deceased, and butchery scenes, as well as hieroglyphs and representations of Kaipure. Some of the hieroglyphs are carved in sunken relief.
- The dimensions of the entire chapel are approximately 12' x 5' x 10'. See **attached multimedia file** for individual block dimensions and estimated weights.
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## HISTORY<sup>1</sup>:

- 1869: first publication about the Kaipure tomb chapel by Auguste Mariette, Director of Egypt's Antiquities Service.
- Ca. 1885: Auguste Mariette conducted a more thorough study.
- Ca. 1900-1904: Photographs were taken in situ; the chapel was dismantled and transported to St. Louis, Missouri.

<sup>1</sup> Silverman, D. 2015. "From Saqqara to St. Louis to Philadelphia" *Expedition Magazine* 57.1. Philadelphia: Penn Museum, April 2015 Web. 11 Jul 2017 <<http://www.penn.museum/sites/expedition/?p=22592>>

- 1904: exhibited at the Louisiana Purchase Exposition in St. Louis (the Fair opened on April 30, 1904).
- End of 1904: The Free Museum of Science and Art (now the Penn Museum) acquired the offering chapel with other Egyptian artifacts from the Fair. Ms. Sara Yorke Stevenson was the President of the Department of Archaeology at the Museum at the time. Mr. John Wanamaker, President of the Wanamaker department store chain, and manager of the Museum, contributed financially to the transaction, and donated the artifacts to the Museum.
- 1905: arrived at the Museum.
- 1905-1926: stored in the Museum's basement.
- 1926: installation on the lower floor of the Eckley B. Coxe Wing.
- 1974: Minor conservation treatment; this treatment hasn't been documented in detail.
- 1996-97: dismantling and conservation treatment of the West wall was undertaken by Conservation Technical Associates LLC of Westport, CT (Linda Merk-Gould, principle conservator), under the supervision of Lynn Grant, Penn Museum's Conservator for Loans and Traveling Exhibits. The East and South walls were left on display; no treatment was carried out.
- 1997-2000: the West wall travels as part of the "Searching for Ancient Egypt" exhibition.
- 2000-present: the West wall returns from exhibition, crated, and is stored in two discrete climate controlled off-site storage facilities.
- 2015: the East and South walls are dismantled and stored in the Lower Egypt gallery.
- 2017: treatment of the East and South walls performed in an enclosure in the Lower Egypt gallery.

**ENTRY DATE:** April 18, 2017

**EXIT DATE:** April 20, 2018

**EXIT LOCATION:** Lower Egypt (Sphinx) Gallery

**TREATED BY:**

- Céline Chrétien
- Anna O'Neill
- Jonathan Stevens
- Céline Wachsmuth
- Molly Gleeson

**REASON FOR ENTRY:** The chapel will be moved to off-site storage before the gallery's renovation.

**OTHER RECORDS (PREVIOUS TREATMENTS AND MATERIALS USED):**

- Time of creation: Distinct types of repair materials used by the chapel's creators (noted as "Ancient Repairs" in 2017 treatment reports):
  - Hard, salmon-colored mortar: Appears to be crushed stone with a cementing agent such as calcium hydroxide (set into calcium carbonate)<sup>2</sup>.
  - Hard, gray mortar: Appears to be a mixture of sand and calcium hydroxide (set into calcium carbonate).
  - Crumbly, light tan mortar: Crushed stone or sand aggregate with unknown binder; used between blocks.
  - Soft, dense, white material: Composition unknown, appears similar to gesso.
- Excavation (late 1800s): Egyptian excavators marked the top of each block in Arabic using red paint. At some point soon thereafter, the blocks were marked in black grease pencil with a numbering system.
- Transport to the United States (c. 1900): Several of the blocks bear shield-shaped US customs stickers, although these are mostly deteriorated and illegible.
- Post-excavation treatments not found in records; could have been undertaken any time between excavation, display at the 1904 St. Louis World's Fair, and installation at the Penn Museum in 1926: Multiple added materials, including:
  - Shiny, transparent, brown material as found on blocks 59B and 83: Visually similar to shellac but does not fluoresce under UV radiation. FT-IR analysis suggests similarity to an adhesive found on object E12505D, possibly a cellulose nitrate commonly used at the Penn Museum in the 1920s.
  - Soft, dense, white material as found on block 59: Visually similar to plaster, sensitive to acetone. Applied over brown material noted above.
  - Hard, dense, white plaster: Used to cement blocks together, likely applied during 1926 installation. Carved to match block decoration in some cases, notably on blocks 80 and 74A, 74B, and 74C. Softens slightly in water but is not solvent soluble.

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<sup>2</sup> Cunningham-Adams, C. 22 October, 1996. "Preliminary Conditions Report: Painted Walls of the Egyptian Tomb Room". Sandy Hook: Cunningham-Adams Fine Arts Painting Conservation. In: Merk-Gould, L. 1998. "Conservation Treatment Report, Kapure Offering Tomb Chapel, Egyptian 5<sup>th</sup> Dynasty". Westport: Conservation Technical Associates, LLC.

- Installation at Penn Museum (1926): The blocks were attached to a wooden support structure with the use of metal fasteners anchored into the reverse, top, and bottom faces of the stones. Holes were drilled into the stone, packed with wadding (string, cotton, wood chips), and fitted with a metal anchor (the metal seems to vary). Fasteners were then inserted into the anchors and fitted to the wooden support. The anchor holes vary in depth, diameter and angle. (See “Pin Anchor Map” for observed locations of anchor holes.)
- 1974-1975: Desalination and consolidation treatment at Penn Museum<sup>3</sup>. Basic treatment summary:
  - Solvent removal of graffiti
  - Surfaces consolidated with several applications of polyvinyl acetate in ethanol; PVAc exhibited yellowing and darkening by 1996
  - Desalination/reduction of soluble salts using paper pulp method described by Plenderleith<sup>4</sup>
- 1996-1998: Treatment of West wall by Conservation Technical Associates, LLC of Westport CT under supervision of Lynn Grant, Penn Museum Conservator for Loans and Traveling Exhibits<sup>5</sup>. West wall was dismantled and treated for the traveling exhibition, “Searching for Ancient Egypt”. The East and South walls remained on display at the Penn Museum and were not treated at this time. Report for West wall includes scientific analysis. Basic treatment summary:
  - Soil removed using solution of 20-50% Vulpex (potassium methyl cyclohexyl oleate) liquid soap in naphtha; blocks were continuously spray rinsed with naphtha to remove Vulpex residue, then swabbed with acetone
  - Discolored polyvinyl acetate removed by swabbing and poulticing with acetone
  - Graffiti removed using Staedtler Mars white plastic eraser; areas were swabbed with acetone to remove residue
  - Front faces consolidated using progressive treatments of 3%, 5% and 10% Paraloid B72 in 1:1 acetone:ethanol applied using a mister until the consolidant pooled on the surface
  - Desalinated blocks using nebulous water treatment
    - Salts determined to be yellow ferric chloride and crystalline sodium chloride
  - Consolidated ancient fills softened or lifted during desalination by injecting 20% Paraloid B72 in 1:1 acetone:ethanol; resulting darkened areas were inpainted with pigmented resin
  - Small fragments reattached using SIKA 35 epoxy
  - Large fragments repaired using #316 stainless steel pins secured with SIKA 32 or SIKA 35 epoxy. Individual repairs noted in report
  - Fills of Plaster of Paris with Jade 403 (polyvinyl acetate emulsion adhesive) (.5 teaspoon: 1 cup Plaster of Paris) used to square edges of blocks and repair large

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<sup>3</sup> Davies, D. 20 May, 1975. “Conservation Treatment Report for E15729, Lab No. 1126”. Philadelphia: Penn Museum.

<sup>4</sup> Plenderleith, H.J. 1956. *The Conservation of Antiquities and Works of Art: Treatment, Repair and Restoration*. New York: Oxford University Press.

<sup>5</sup> Merk-Gould, L. 1998. “Conservation Treatment Report, Kapure Offering Tomb Chapel, Egyptian 5<sup>th</sup> Dynasty”. Westport: Conservation Technical Associates, LLC.

areas of loss. Large fills required stainless steel pins. Fills were inpainted using tinted latex paint.

- Pre-existing anchor holes were injected with Hilti HY150 epoxy
- Blocks prepped for stainless steel frame by cutting away excess stone and drilling anchor holes. Stainless steel anchors epoxied into holes using Hilti HY150 epoxy
- Reverse faces consolidated using 10% Paraloid B72 in 1:1 acetone:ethanol, then coated with Butcher's wax to isolate grout material
- Large blocks secured to frame using grade 5 bolts. The reverse was "packed" with SIKA 212 structural grout to form a continuous support surface. Smaller stones were fixed in place by pinning to large stones below. A layer of Volara foam and Teflon are used between the blocks
- 2015: Triage consolidation and deinstallation of East and South walls by Penn Museum conservators Emily Brown and Madeleine Neiman due to vibrations caused by the destruction and construction of the University of Pennsylvania hospital next door<sup>6</sup>.

Treatment summary:

- Surface-cleaned loose dirt and debris using Nilfisk vacuum and soft bristle brush
- Consolidated powdery and flaking paint using 2.5%, 5% and 7.5% w/v Paraloid B72 in 10:1 acetone:ethanol
- Consolidated lifting paint and ground using 7.5% w/v Paraloid B72 in 10:1 acetone:ethanol; flakes were then reattached to surface using 40% w/v Paraloid B72 in 10:1 acetone:ethanol
- Powdering and blistering stone was temporarily consolidated using cyclododecane spray
  - Note: Ammonium phosphate was tested on block 87 but was discontinued
- Sharp edges and adhered fragments were protected and reinforced using 40% w/v Paraloid B72 in 10:1 acetone:ethanol bulked with 3M microballoons
- Wall was disassembled by Harry Gordon Studios, LLC with Penn Museum conservators and staff

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<sup>6</sup> Brown, E. E. and Neiman, M. 11 Decemner, 2015. "E15729 Examination and Treatment Report 2015\_Final". Philadelphia: Penn Museum. See also: EMu records for E15729 and E15729.34 through E15729.93.

## CONDITION

For visual representations and detailed definitions of the terms used in this report, please see attached multimedia file: “Kaipure Visual Glossary”.

For detailed reports of the condition of each individual block, please see the 2017-18 conservation records for E15729.34-E15729.93.

## OVERALL CONDITION

The condition of the wall varies dramatically across the surface from block to block. As a whole, the wall is very dirty and the surface is very fragile. Deterioration of the stone and decoration make handling most blocks very precarious. Powdery, greasy, and inset dirt obscure the decoration and impact the legibility of the wall as a whole.

In general, higher quality stone and craftsmanship is evident near the chapel entrance and at eye level, while poorer quality stone and decoration is concentrated toward the back (South) end of the room and along the lower course of blocks. The blocks are composed of limestone with inclusions of quartz and clay and were carved and painted after being installed in the mudbrick walls of the chapel. Imperfections in the stone surface were filled with ancient repair materials (as noted above) and the entire block was coated with a calcium-based ground layer before painting. This ground layer is not evident on every block. It is unclear whether this is due to loss or if it was not applied to every surface.

Since its installation in the Penn Museum in 1926, the wall was supported by a wooden structure to which it was attached by fasteners? anchored in the sides and backs of the blocks. Before deinstallation, the wall was visibly bowed with the central portion protruding slightly outward. When the wall was dismantled in 2015, it was discovered that the wooden armature was no longer providing any vertical support to the blocks, which were resting on top of each other as a result<sup>7</sup>. This put great compressive pressure on the stone, which was not designed to bear weight; the wall would have originally been supported by a mudbrick structure.

## STONE CONDITION

The softness of the Egyptian limestone, combined with its non-homogenous composition and the historic presence of soluble salts (identified as NaCl, KNO<sub>3</sub> and FeCl<sub>3</sub>)<sup>8</sup>, has caused surface deterioration, while the compressive pressure from installation has caused structural damage within the stones.

- *Cracking/fractures/stone loss*: Several of the blocks exhibit visible superficial and structural cracks and fractures, and others have broken into separate fragments (these have individual conservation records in Emu). This damage appears to be due to

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<sup>7</sup> Brown, E. E. and Neiman, M. 11 Decemner, 2015. “E15729\_Examination and Treatment Report\_2015\_Final”. Philadelphia: Penn Museum. See also: EMu records for E15729 and E15729.34 through E15729.93.

<sup>8</sup> Wheeler, G. S. 21 November, 1996. “Petrographic and Chemical Studies of an Egyptian Tomb Stone Sample for Conservation Technical Associates, LLC”. Austin: Erlin, Hime Associates. In: Merk-Gould, L. 1998. “Conservation Treatment Report, Kapure Offering Tomb Chapel, Egyptian 5<sup>th</sup> Dynasty”. Westport: Conservation Technical Associates, LLC.

compression, with semicircular cracks radiating out from points of high pressure on many pieces. One block has a significant crack which extends through the thickness of the stone. Almost every block has losses to the edges and corners, and many of the high points in the carved decoration exhibit physical wear.

- *Note:* Some edges with sharp corners or cracks due to loss were protected during the 2015 deinstallation using Paraloid B72 bulked with glass microballoons.
- *Delamination/blistering/granular disintegration/surface deterioration:* In general, the front faces of the stone are much more cohesive than the unfinished sides and backs; these unfinished surfaces are all very powdery. There are also areas of powdery stone within pits and losses on the front faces of the blocks. The granular disintegration at or directly below the surface layer of the stone can possibly be attributed to the historic presence of soluble salts as well as weathering and natural deterioration; however, there were no visible soluble salts on the blocks at the time of examination. There are examples where the stone has broken along crystalline or clay-rich seams. Where the granular disintegration has occurred beneath the prepared surface, this has caused spalling/blistering/delamination of the outer layer of stone. These areas have lifted so much in certain areas that light is visible beneath the separated layers. A distinct weathering pattern on the top-left/bottom-right diagonal affects the blocks closest to the entrance and is particularly visible in the *in situ* photograph taken at Saqqara at the time of excavation.
  - *Note 1:* Due to an evolving understanding of active granular disintegration, early reports may refer to general areas of stone loss with an uneven exposed surface as “granular disintegration”, while later reports only use this term to identify actively powdering areas.
  - *Note 2:* Areas of stone deterioration were consolidated during the 2015 deinstallation using a spray application of cyclododecane. This stabilized the areas long enough for the blocks to be moved onto pallets but has since sublimated, leaving the fragile surfaces as they were prior to consolidation.
- *Deterioration of ancient fills and mortar:* In many instances, the ancient fills have begun to separate from the stone surface, revealing powdery stone beneath; these are very susceptible to mechanical damage, especially around the thin, lifted edges. The stability of the fills varies depending on their composition; the salmon-colored mortar used in larger fills is compact and structurally sound, while the gray fill material is much lighter and more brittle. The white, “gesso”-type fills are very powdery. The ancient mortar used between the blocks is very crumbly and appears to be iron-rich on several blocks.

## **PAINT/GROUND CONDITION**

- *Loss/deterioration of paint and ground:* The tomb chapel was extensively polychromed, with the quality and application of the painted surface varying across the wall. The current condition of the paint and ground also varies dramatically from block to block. As a rule, the blocks closest to the entrance of the chapel (left side while facing wall) retain less paint and ground, while the decoration is much more intact towards the south end of the room. The ground layer is lifting/flaking around the edges on most blocks and is susceptible to damage from mechanical action. Large losses to ground and pigment



appear to be due to either the decohesion/powdering of the stone surface or abrasion due to weathering *in situ*. The condition of the paint appears to be dependent both on the pigment type and whether it was applied over ground or (apparently) directly to the stone.

- *Red*: Generally intact and vibrant on ground; powdery and faded but relatively cohesive where applied directly to stone.
  - *Orange*: Generally intact and vibrant on ground; only faint traces left on stone surface.
  - *Bright yellow*: Generally very faded on ground; not found on stone surface.
  - *Dark yellow*: Generally intact and vibrant on ground; only faint traces left on stone surface.
  - *Green*: Presents as coarse and often powdery on both stone and ground;
  - *Blue*: Presents as coarse and often powdery on both stone and ground; present but very powdery on ground; only present in traces on stone surface.
  - *Black (carbon-based)*: Transparent and faded on ground; not found on stone surface.
  - *White (calcium carbonate/calcium sulfate)*: Only traces present on ground and stone surface. More extensive white pigment survives on blocks 93A and 93B.
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- *Note 1*: “Ground” may also be referred to as “whitewash”, “preparation layer”, or “preparatory layer” in reports.
  - *Note 2*: Powdery paint and flaking ground were consolidated during the 2015 deinstallation using low percentage Paraloid B72. Because the paint had to be stabilized before cleaning, some surface soiling was unavoidably consolidated at the same time.

#### **EXTERNAL FACTORS:**

- *Soiling*: The surfaces of all the blocks are dull and grayed with years of museum dirt and possibly burial material. The top surfaces of each block are covered in a heavy layer of dust which obscure the numbers and characters painted on top. The edges of each block are dark from handling; shiny, greasy areas on the faces of some blocks also indicate where the wall may have been touched or rubbed; this is especially concentrated on areas closest to the entrance of the chapel. The powdery black pigment used to mark numbers on the tops and sides of the blocks is also present as transfer from handling.
- *Modern interventions/materials*: Modern treatments/restorations, including adhesive, plaster, paint, and other materials are visible on certain blocks.
  - *Markings from excavation/transport/installation*: The Egyptian excavators marked each block on the top surface in red paint, which remains relatively cohesive. What may have been black grease pencil was used to mark the sides of the blocks, but the binder has deteriorated and the heavy black pigment is easily smudged and transferred.
  - *Brown adhesive*: Small fragments were reattached using an adhesive that has discolored to a shiny dark brown color; while this is very flaky where exposed, there are several fragments where this adhesive is still intact and the join is stable.

- *Plaster/grout*: There are several instances where blocks were attached to each other using a very hard white plaster/grout material. In some cases, this has caused the blocks to be misaligned, while in other places the blocks appear to be correctly positioned relative to each other. Some of these blocks were separated during the 2015 deinstallation, but deposits of the material remain on the surfaces.
  - *Exhibition materials*: The exhibition wall appears to have been installed and finished after the chapel was erected in the gallery. The edges of the blocks along the top and bottom of the wall show traces of a soft plaster, as well as several layers of differently colored overpaint. At least one of these layers is possibly a cross-linked casein paint, while there may also be a layers of latex-based paint or other commercial paints. Many blocks have small, directional drips of paint on the surface.
  - *Previous consolidation*: Previous consolidation (likely using polyvinyl acetate) is evident along the south wall. It has yellowed/discolored and appears white under ultraviolet radiation.
  - *Unknown material*: There are long, dark drips of an unknown material on the surfaces of many blocks. This material is shiny in areas where it has slightly built up. It fluoresces bright orange under ultraviolet radiation.
- *Graffiti/vandalism*: During its time at the World's Fair and early exhibition at the Penn Museum, the chapel was on open display, until visitor access was restricted and glass protection walls were put up in the late 1980s. Several blocks exhibit evidence of intentional human graffiti, both incised and in pencil. This graffiti obscures or damages the paint and ground layer, and the incised graffiti is very white against the aged stone surface. Block 92, in the corner on the south wall, is covered in extensive graffiti. A piece of chewing gum was discovered on block 81A during the 2015 treatment.
  - *Other surface damage*: There are series of scratches composed of three short, parallel marks on several blocks. This has been observed on other pieces in the museum's collection and may be attributed to chains used to secure the objects during excavation and transport. Another possible explanation is that these are intentional pick marks, used to facilitate the adhesion of the ground layer during creation. Some blocks are also randomly scratched.
  - *Anchor holes*: The blocks were attached to the wooden support structure using metal fasteners and anchors set into the stone. Most of these are lost, leaving only the holes in the stone, but there are many instances where the anchor is tightly wedged into the hole and cannot be removed. Some seem to be dry fit, while others are padded with various wadding materials (cotton, string, wood chips). On a few blocks, corrosion of the anchor has caused it to expand in the hole, causing stress fractures in the surrounding stone.

## **DOCUMENTATION**

Please see the multimedia files attached to this record as well as the individual conservation records for blocks E15729.34-E15729.93 for detailed images, Adobe Photoshop condition and treatment maps, and written documentation.

Blocks were photographed before and after treatment. Most blocks were too large to turn over without the assistance of rigging, so the reverse (undecorated and unfinished) faces were not treated and not photographed.

## TREATMENT

For detailed reports of the treatments for each individual block, please see the conservation records for E15729.34-E15729.93.

*Note:* The larger blocks were too heavy to turn over without the assistance of rigging and support, so the reverse (undecorated, unfinished) faces of these were not treated at this time.

### TREATMENT OBJECTIVE

The blocks are going to be crated and moved to an off-site storage facility before the renovation of the Museum's Egyptian Galleries. The goal of this phase of treatment is to clean and stabilize the stone and paint so that the blocks can be safely transported and handled, preventing further loss of original material. The blocks will be cleaned, consolidated, and fragile surfaces protected.

### TREATMENT PROCESS

The general treatment procedure for each block was as follows:

#### *Cleaning, front/decorated faces:*

- Surface, if stable enough, was vacuumed using Nilfisk vacuum and soft bristle brush
- Surface, if stable enough, was dry cleaned as needed using the following:
  - Akapad soft or hard yellow sponge
  - Staedtler Mars white vinyl eraser
  - Non-latex cosmetic sponge
- Surface, if stable enough, was solvent cleaned as needed using the following on cotton swabs to remove ingrained dirt, greasy deposits, paint, and other non-original materials:
  - Acetone
  - Ethanol
  - 1:1 ethanol:deionized water
  - Deionized water
  - Saliva (cleared with acetone or ethanol)
- If cleaning revealed discoloration or encapsulated dirt caused by prior consolidation, the old consolidant was reduced using acetone on cotton swabs and the area cleaned again following the steps above as necessary.
- Historic restoration or installation-related plaster was softened with water or saliva and mechanically removed using a scalpel. Especially heavy deposits of plaster were reduced using a Dremel rotary tool with an abrasive attachment until they could be removed with a scalpel. In some instances where it would have been detrimental to the object to remove the plaster, it was reduced as much as possible to match the surface or to allow proper alignment of adjacent blocks.
- See attached multimedia file on cleaning tests.

#### *Consolidation and stabilization, front/decorated faces:*

- Powdery paint and stone were consolidated applying 2% w/v Paraloid B72 in 1:1 acetone:ethanol with a small brush; areas were prewetted with ethanol, acetone, or 1:1 acetone:ethanol to encourage penetration of the consolidant. Additional applications of

the 2% solution or higher concentrations (5%, 7.5% or 10%) were used as necessary, although this often increased the sheen or saturation of the area or caused discoloration.

- Lifting or flaking paint and ground was consolidated as above and then reattached using 20-40% w/v Paraloid B72 injected via syringe or brushed under the flake.
- Areas of tented paint/ground which could not be safely flattened were consolidated as above and then supported by injecting Paraloid B72 bulked with glass microballoons into the void.
- Areas of lifting paint, ground, ancient fills, and the stone itself were supported around the edges where the material might be especially subject to mechanical damage using Paraloid B72 bulked with glass microballoons, applied with a syringe (referred to as “edging”). The surfaces were preconsolidated with 2% w/v Paraloid B72 in 1:1 acetone:ethanol prior to application; the edging was shaped after application using acetone on a small brush or cotton swab.
  - *Note:* The earliest treatments used Flügger (acrylic putty with calcium carbonate filler), then Modostuc (polyvinyl acetate putty with calcium carbonate filler) for edging. Ultimately, it was decided to perform all edging with Paraloid B72 bulked with glass microballoons for ease of use and reversibility, and to minimize the number of materials added to the object. Fill materials are noted in the individual conservation records.
  - *Note:* In some cases the adhesive mixture used to make bulked B72 preparation contained fumed silica. (See individual reports for details.)
- Large cracks were injected with 2-5% w/v Paraloid B72 in 1:1 acetone:ethanol.
- See attached multimedia record on consolidation tests.

#### *Reattachment of fragments:*

For the most part, fragments from individual blocks were not reattached to each other; the attachment of larger fragments will be part of the decision-making process when designing the new support structure for the wall. However, there were several instances where smaller fragments could be re-adhered to the larger block to reduce the total number of separate pieces.

- Fragments were first cleaned and stabilized, removing all previous adhesive material using the methods described above.
- All break edges were consolidated with 2% w/v Paraloid B72 in 1:1 acetone:ethanol; surfaces were prewetted with 1:1 acetone:ethanol to encourage penetration of the consolidant.
- The fragments were reattached using dots of 40-50% w/v Paraloid B72 in 1:1 acetone:ethanol. The pieces were aligned, then held in place using props and straps or clamps while the adhesive set.

#### *Loss compensation, front/decorated faces:*

Full loss compensation was not undertaken; the decision to restore the edges and large losses of the blocks will be part of the final aesthetic decision making process once the wall has been remounted on the new support system. However, structural fills were made to support gaps between fragments or to protect sharp or concave edges so that the blocks would be safe to transport and handle.

- Areas where there were sharp edges or concave losses to the stone or ancient fill were protected using Paraloid B72 bulked with glass microballoons. These areas were

preconsolidated with 2% w/v Paraloid B72 in 1:1 acetone:ethanol prior to application; the fills were shaped using solvents as well as mechanically.

- Large gaps between adhered fragments were filled using several layers of lime mortar (2 parts aggregate (sand/marble dust): 1 part non-hydraulic lime putty: .5 parts 25% Plextol in deionized water), allowing 24 hours drying time between each layer to reduce shrinkage of the fill. See attached multimedia record on loss compensation tests.

*Inpainting/aesthetic integration:*

All edging and small infills were inpainted to blend visually with surrounding areas so that they would not have to be addressed in a later phase of treatment. However, larger infills were not inpainted so that they could be integrated as part of the final aesthetic decision making process.

- Edging and small infills were inpainted with watercolor and/or acrylic paints (as noted in individual conservation records).
- The lime mortar fills on block 69 were inpainted with watercolor. No other lime fills were inpainted.
- Incised graffiti was first coated with a barrier layer of 2% w/v Paraloid B72 in 1:1 acetone:ethanol, and then inpainted with watercolor or acrylic paint (as noted in individual conservation records).
- On a few blocks, areas of distracting recent pigment loss (resulting in a bright white area of exposed stone) were coated with a barrier layer of 2% w/v Paraloid B72 in 1:1 acetone:ethanol and toned to match the surrounding area using watercolor or acrylic paint (as noted in individual conservation records).
- The plaster connecting blocks 80 and 74A, as well as the plaster extending onto block 81A was considered too ingrained to safely remove. When cleaned, the body of the plaster was stark white, and had a gray appearance where it was smeared onto the stone. The plaster was uniformly inpainted to integrate it with the background color of the stone; it was not painted to match any painted or variegated surfaces but rather to minimize the impact of the added material.

*Cleaning and consolidation, all other faces:*

*Note:* Many of the large blocks could not be turned over without the assistance of rigging to access the reverse face. These are noted in individual reports and will be treated at a later phase of the project.

- All faces cleaned with a Nilfisk vacuum and a soft bristle brush.
- All faces cleaned with an Akapad soft or hard yellow sponge.
- Powdery numbers were consolidated using several coats of 5-20% w/v Paraloid B72 in 1:1 acetone:ethanol until they were no longer powdery to the touch.
- Some of the blocks had customs stickers attached to the top face; these were either removed and bagged or secured to the stone surface using 20-40% w/v Paraloid B72 in 1:1 acetone:ethanol.
- All faces consolidated by brushing on two coats of 2% w/v Paraloid B72 in 1:1 acetone:ethanol. Surfaces were prewetted with 1:1 acetone:ethanol before first coat to encourage penetration of the consolidant.
  - *Note:* The consolidant/solvent caused yellowing of the stone surface on many of the blocks. This was considered an acceptable level of change as these surfaces

are not visible when the wall is installed and the blocks could not be handled safely without consolidating the sides.

#### **POST-TREATMENT SUMMARY**

The blocks are now clean and stable enough to be safely crated and moved off-site. The few that require special handling are identified by written labels on their pallets. The decoration is brighter and more legible. All of the accessible surfaces have been consolidated where necessary and are no longer actively powdering. Fragile edges have been supported to reduce further damage during handling and transport. While care was taken to clean all the blocks to an equal level, the final unifying treatment will be made once the wall is remounted on the new support structure and can be considered as an aesthetic whole.