



International Course on Stone Conservation SC13

SESSION: Hands-on conservation techniques: pinning and adhesives, grouting and mortar integration

INSTRUCTORS: Stefano Volta, Gionata Rizzi, David Odgers

DATE/TIME: Wednesday, 22nd May / all day; Thursday, 23rd May / all day

SESSION OUTLINE

ABSTRACT

Hands-on experience in a variety of stone conservation techniques is critical for putting theory into practice. In this workshop, participants learn how to implement physical repairs to damaged stone including grouting a crack, integrating an area of loss with color-matched mortar, and joining broken pieces of stone.

OBJECTIVES

By the end of the workshop participants will:

- Learn how mortar is mixed using a mortar mill
- Patch an area of stone loss with color-matched mortar, building on previous sessions in the course devoted to mixing mortars
- Repair a crack with lime-based grout and mortar
- Understand the variety of pins and adhesives available for the structural repair of stone and which materials to select depending on stone type and condition
- Repair a broken masonry unit with adhesive and pins
- Understand the variety of steel and synthetic fiber meshes available for the reinforcement of a broken stone slab
- Repair a broken slab with adhesives and carbon fiber mesh
- Gain practical experience with various methods of cleaning stone

CONTENT OUTLINE

The first day of the workshop is devoted to repairs with mortar and grout, and includes the following activities:

1. Demonstration of materials used for mixing mortars and grouts, including different types of hydraulic and non-hydraulic lime, aggregates and colorants.
2. Demonstration of mixing a typical hydraulic lime-sand mortar mixture using a mortar mill.
3. Demonstration of injection techniques for grouting a crack, including:
 - a. Mixing color-matched lime-based grout using a variety of aggregates.
 - b. Preparing the crack; cleaning with compressed air and flushing with water or alcohol.
 - c. Use of oil-based putty to temporarily seal the crack during injection.
 - d. Use of plastic tubing to control grout flow
 - e. Injecting grout in stages, ensuring that the crack is properly filled.
4. Demonstration of integrating lacunae with micro-spatulas and color-matched mortar.
5. Seven work stations are prepared, each with a historic stone architectural object that requires treatment. Participants break into groups of 2-3 to practice grouting and mortar integration.



SESSION OUTLINE CONT'D.

Day 2:

The second day of the workshop is devoted to learning how to join and fix a broken stone object and slab. Activities include:

1. Demonstration of the wide variety of steel and carbon fiber pins and meshes available for use in bonding and structural stabilization of stone, including:
 - o Smooth, textured and sanded carbon fiber pins of various thicknesses
 - o Threaded stainless steel pins
 - o Woven stainless steel mesh and a variety of

Also demonstrated are a variety of epoxies, resins and adhesives as well as filler/thickeners used for fixing pins in place.

2. Demonstration of the process of pinning broken pieces of stone, including:
 - o Accurately measuring and marking locations of holes for pins on both sides of a break
 - o Drilling straight pin holes using masonry drill bits
 - o Mixing epoxy resin with fillers such as fumed silica, microballoons or carbon fibers to decrease viscosity
 - o Ensuring a tight bond using clamps, straps, etc.
3. Demonstration of the process of repairing a broken stone slab with reinforcing mesh.
4. Following the demonstrations, participants break into groups and work on pinning, joining and fixing a broken object or slab.



Figure 1 Demonstration of pinning techniques. Parma, Italy, 2013.
Photo: Benjamin Marcus.





Figure 2 Participants pinning a stone lintel. Parma, Italy, 2013.
Photo: Benjamin Marcus.

READINGS

 = Essential reading material

 = Available online

 Odgers, David, Alison Henry, and English Heritage, ed. 2012. *Practical Building Conservation: Stone*. Farnham: Ashgate

 English Heritage. 2011. *Practical Building Conservation: Mortars, Plaster and Renders*. Surrey: Ashgate Publishing.

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