International Course on Stone Conservation SC13

SESSION: Historic mortars – investigation and analysis

INSTRUCTOR: David Odgers

TIME: Monday, 6th May/ 9:30-11:00 (1.5 hours) & Laboratory sessions

SESSION OUTLINE

ABSTRACT

Mortars can provide significant information about the origins of a stone building, its method of construction and previous interventions. A study of the mortar is essential to inform any proposed repair. In many cases, mortars have failed and it is important to understand the reasons for this so any replacement mortars can be formulated to provide the appropriate characteristics.

OBJECTIVES

- To understand the important physical and aesthetic characteristics of mortar and what role these individual characteristics play alone and in combination.
- To understand how mortars change over time.

CONTENT OUTLINE

- Important mortar properties and how these can be assessed and measured.
    - Hardness
    - Porosity
    - Permeability
    - Colour
    - texture
- Using examples of historic mortars, participants will conduct visual analysis and recording of historic mortar samples and will be asked to present their conclusions.
- Different mortar analysis techniques.
- Criteria for selecting a replacement mortar to match an historic mortar.

Participants are encouraged to bring mortars from their own field work to be used in this exercise. See attached worksheets for recording laboratory analysis data.

READINGS

📖 = Essential reading material
💻 = Available online

📖 💻 Schnabel, Lorraine. 2009. Practice Points No. 07: Mortar analysis part 2: Analytical methods. *APT Bulletin* 40 (2):1-7. http://www.apti.org/clientuploads/publications/PracticePoints/PracticePoints11.pdf

📖 💻 Teutonico, Jeanne Marie. 1988. *A Laboratory Manual for Architectural Conservators*. Rome: ICCROM. http://007.iccrom.org/ifrcdn/pdf/ICCROM_11_LabManual_en.pdf

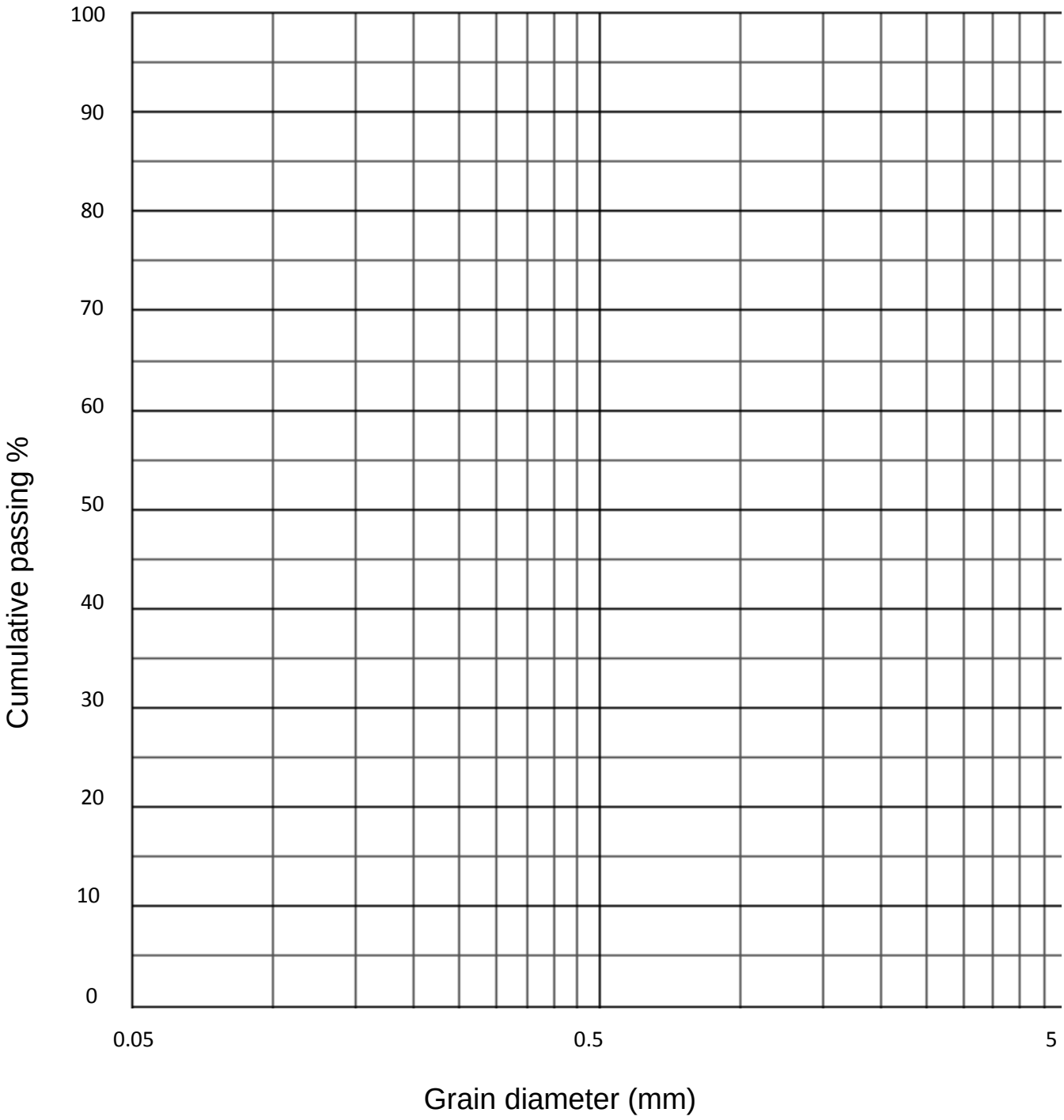
Válek, J., C. Groot, and J J. Hughes, ed. 2010. *Historic Mortars: Hmc 2010 and Rilem Tc 203-Rhm Final Workshop* Bagneux, France: RILEM Publications.

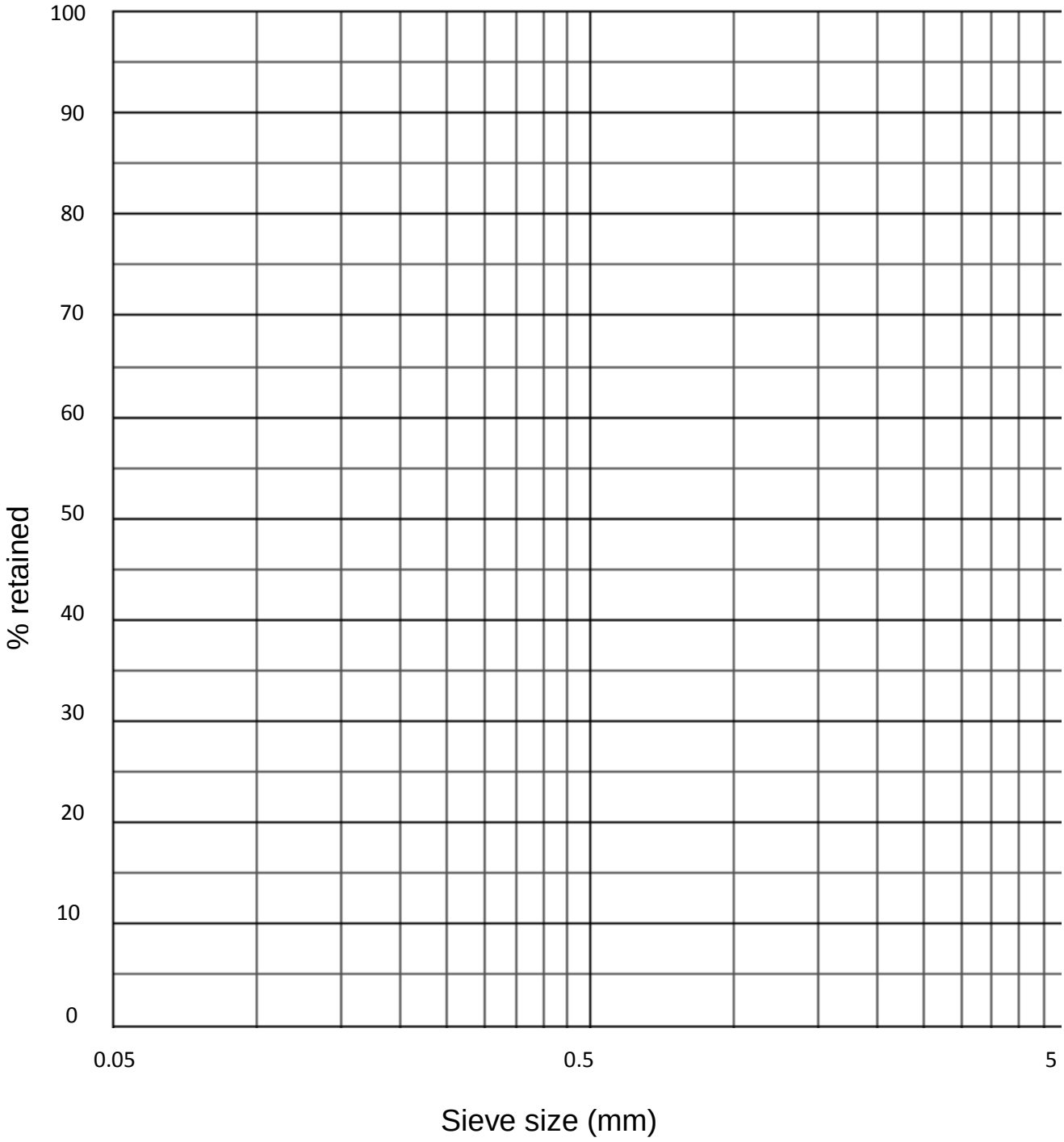
MORTAR ANALYSIS REPORT SHEET

Site:	**Location of sample:**		**Date taken:**
Context of sample (environmental conditions/history of building, etc)			
Dimensions of sample:	**Colour:**	**Hardness:**	**Permeability (drop) test:**
Description of sample:			
Microscopic image:			
Reaction with hydrochloric acid:			
Wt. of dry sample:	**Wt. of solid residue after dissolution:**		**Estimated binder:aggregate ratio:**
Description of residue:			

AGGREGATE/MORTAR ANALYSIS
Determination of particle size distribution by sieving

Origin of sample:				
Description and location of sample:				
Test carried out by:		**Date:**		**Ref No:**
Total mass of sample (M1):				
BS sieve size	**Mass retained (M3)**	**% retained [(M3/M1)*100]**	**Cumulative % passing**	**Visual inspection and other comments**
>5mm				
5mm				
2.36mm				
1.18mm				
600µm				
300µm				
150µm				
Receiver (0.05 µm)				
TOTAL		% error – if total differs from original mass (M1) by more than 3% then results should be reviewed or rejected		


100
90
80
70
60
50
40
30
20
10
0
Cumulative passing %
0.05
0.5
5
Grain diameter (mm)


100
90
80
70
60
50
40
30
20
10
0
% retained
0.05
0.5
5
Sieve size (mm)