Conservation of Historic Renders and Plasters: From Laboratory to Site

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Abstract In interventions on historic renders and plasters, the first step is to decide upon the strategy: repair or substitution, based on an evaluation of the cultural value of the render or plaster, of the building itself and on a careful diagnosis of the typology of defects, their density and reparability. New renders or repaired renders should fulfil the main functions they are required to, especially protection and aesthetic functions Compatible materials should always be used. Compatibility is needed for durability, not of the render, but of the wall as a whole, and also for preserving the documentary and symbolic value of the building as well as its image. Compatibility is defined in relation to the substrate and the existing mortars. Therefore tests need to be carried out on the old materials and on possible solutions, to compare characteristics and assist in the selection of the best. It is acceptable to begin using non-destructive or slightly destructive in-situ tests, because with them it is possible to collect useful information quickly and without destruction of the historic renders. Simple mechanical and physical tests can be carried out on the old mortars and a few chemical tests can also be performed, with portable equipment. If rigorous and complete tests are needed, some samples can be collected and tested in the laboratory, using methods adapted to non-regular, possibly friable specimens. The characteristics of the mortars to use can be established, based on the results obtained, in order to fulfil both functionality and compatibility. However, sometimes it is not possible to obtain enough data about old materials, especially concerning masonry as a whole, which is more difficult to test than mortars. For this situation, some general requirements have been established, based on previous work carried out on Portuguese historic masonry buildings, which can be used without risk of damaging existing materials. Decisions concerning the materials to use, especially binder materials, should also take into account the climatic and environmental conditions. Appropriate application techniques, workmanship and curing conditions are indispensable in achieving good aesthetic, physical and mechanical results. Therefore it is important to know what conditions are available for the application phase. An effective knowledge of the historic materials and of the possible compatible solutions, of their characteristics and problems, is essential; tests are an important tool but the interpretation of their results in order to take useful decisions is a complex task, requiring a multidisciplinary team efficiently coordinated.

Conclusions

Decisions about conservation strategy and about the materials to use for the conservation of historic renders and plasters are based on several factors, both of a subjective and an objective nature. Tests play an important role, for an evaluation of the severity of anomalies and for an assessment of compatibility by a comparison of the characteristics of existing materials and proposed solutions. However, they are only a part of the methodology. They should come after a careful expert observation and they must be adequately interpreted. The type of tests and their localisation are to be chosen in order to obtain the maximum information with the minimum intrusion and disruption to the original fabric, and without taking more time than is necessary to fulfil the objectives. Hence, in-situ tests must be used first followed by complementary laboratory tests. Previous results in similar buildings and materials must be taken into account. Functionality, compatibility and adaptation to the prevailing environment and foreseen actions must be considered. Considering all of these factors carefully, creates a new perspective that aims to ensure the improvement of the durability of the whole building, respecting its characteristics.

To plan adequate interventions on historic buildings is a complex task, requiring many skills; therefore a multidisciplinary team must be chosen to do it and given a reasonable amount of time.

1 References

1. Veiga MR, Fragata A, Tavares M, Magalhães A, Ferreira N (2009) Inglesinhos Convent: Compatible renders and other measures to mitigate water capillary rising problems. Int. Journal of Building Appraisal, vol 5, Issue 2, Sept 2009, pp. 171-185. ISSN:17428262; DOI: 10.1057/jba.28
2. Tavares M, Veiga MR, Fragata A (2008) Conservation of old renderings – the consolidation of renderings with loss of cohesion. Conservar Património, 8, December 2008, pp. 13-19
3. Tavares M, Fragata A, Veiga MR (2007) A consolidação da falta de aderência de rebocos antigos – um estudo com diferentes argamassas para grouting. In 2º Congresso Nacional de Argamassas de Construção, APFAC, Lisbon, November 2007
4. Tavares M, Magalhães A, Veiga MR, Aguiar J (2005) Métodos de diagnóstico para revestimientos de edifícios antiguos. Importancia y aplicabilidad de los ensaios in situ. Boletin del Instituto Andaluz del Patrimonio Histórico, nº 53 – Especial critérios, April 2005, pp. 11-17
5. Magalhães A, Matias L, Vilhena A, Veiga MR, Pina dos Santos C (2005) Non-destructive testing for the assessment of moisture defects on ancient walls. Some case studies. In 8th International Conference on Non-destructive Investigations and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage, Lecce (Italy), May 2005
6. Magalhães A, Veiga MR (2009) Physical and mechanical characterisation of ancient mortars. Application to the evaluation of the state of conservation. Materiales de Construcción, Vol 59(295): 61-77 doi: 10.3989/mc.41907

7. Santos Silva A, Borsoi G, Veiga R, Fragata A, Tavares M, Llera F (2010) Physico-chemical characterization of the plasters from the church of “Santissimo Sacramento” in Alcântara, Lisbon. In HMC2010, Prague, September 2010
8. Papayianni I (1998) Criteria and methodology for manufacturing compatible repair mortars and bricks. Compatible Materials Recommendations for the Preservation of European Cultural Heritage, Athens: National Technical University
9. Moropoulou A, Bakolas A (1998) Range of acceptability limits of physical, chemical and mechanical characteristics deriving from the evaluation of historic mortars. Compatible Materials Recommendations for the Preservation of European Cultural Heritage, National Technical University, Athens
10. Veiga MR, Santos Silva A, Aguiar J, Carvalho F (2001) Methodologies for characterisation and repair of mortars of ancient buildings. In Int. Seminar Historical Constructions 2001. Guimarães, Universidade do Minho, November 2001, pp. 353-362
11. Lanas J, Alvarez JJ (2003) Masonry Repair lime-based mortars: Factors affecting the mechanical behaviour. Cement and Concrete Research, 33, pp. 1867-1876
12. Veiga MR, Velosa A, Magalhães A (2006) Evaluation of mechanical compatibility of renders to apply on old walls based on a restrained shrinkage test. Materials and Structures, vol. 40, nº10, December 2006
13. Gonçalves T, Rodrigues J, Abreu M, Esteves A, Santos Silva A (2006) Causes of salt decay and repair of plasters and renders of five historic buildings in Portugal. In Conference Heritage, Weathering and Conservation, vol. 1, Balkema, Madrid, pp. 273-284, ISBN 0-415-41272-2
14. Santos Silva A, Veiga MR(2008) Degradation and repair of renders in ancient fortresses close to the sea. In MEDACHS 08 - 1st Int. Conference Construction Heritage in Coastal and marine Environment, Lisbon, LNEC, 8 p
15. Borges C, Santos Silva A, Veiga MR (2010) Ancient mortars under action of marine environment: a physico-chemical characterization, In HMC2010, Prague, September 2010.
16. Candeias AE, Nogueira P, Mirão J, Santos Silva A, Veiga MR, Casal MG, Seruya AI (2006) Characterization of ancient mortars: present methodology and future perspectives, Internacional Workshop Chemistry for the Conservation of Cultural Heritage: Present and Future Perspectives, EU-ARTECH, Perugia, Italy, 4 p
17. Válek, J, Veiga R (2005) Characterisation of mechanical properties of historic mortars - Testing of irregular samples. Advances in Architecture Series Volume 20, pp. 365-374
18. Veiga MR, Magalhães A, Bosilijkov V (2004) Capillarity tests on Historic mortar samples extracted from site. Methodology and compared results. In 13th International Masonry Conference, Amsterdam, July 2004
19. Magalhães A, Moragues A, Veiga MR (2004) Application of some methods on evaluation of porous systems of wall renderings. VII Congreso Internacional de rehabilitación del patrimonio y edificación", Lanzarote, July 2004
20. Veiga MR, Fragata A, Velosa A, Magalhães A, Margalha G (2008) Substitution mortars for application in historical buildings close to the sea environment. Analysis of the viability of several types of compositions. In Medachs – Construction Heritage in Coastal and Marine Environments, Lisbon, LNEC, January 2008
21. Veiga R, Fragata A, Velosa A, Magalhães A, Margalha G (2008) Lime-based mortars: viability for use as substitution renders in historical buildings. Int. Journal of Architectural Heritage vol. 4 (2), pp.177-195, April-June 2010. Philadelphia: Taylor and Francis. Paulo B. Lourenço and Pere Roca eds. Special Issue: Select papers from HMC 2008 – The first Historical Mortars Conference. ISSN 1558-3058
22. Penas F, Veiga MR, Gomes A (2008) Hydraulic lime mortars to use in old buildings: advantages and drawbacks. In HMC08 – 1st Historical Mortars Conference 2008: Characterization, Diagnosis, Conservation, Repair and Compatibility, Lisbon, LNEC, 24-26 September 2008

23. Fragata A, Veiga MR (2010) Air lime mortars: the influence of calcareous aggregate and filler addition. Materials Science Forum, vols 636-637 (2010) p. 1280-1285, 2010 Trans Tech Publications, Switzerland. Doi10.4028/www.scientific.net/MSF.636-637.1280
24. Margalha G (2009) Mineral air binders. Hydration processes and the time factor in their quality (in Portuguese). Ph.D Thesis by Instituto Superior Técnico (IST) of Technical University of Lisbon, January 2009
25. Cavaco L, Veiga MR, Gomes A (2003) Render application techniques for ancient buildings. In 2nd Int. Symposium on Building Pathology, Durability and Rehabilitation, Lisbon, LNEC, CIB, November 2003
26. Balksten K, Klasén K (2005) The influence of craftmanship on the inner structures of lime plasters. In RILEM Workshop, Delft, January 2005