

Chapter 2 Review on the characterization of earth used in earth construction materials

Jean-Emmanuel Aubert¹, Paulina Faria², Pascal Maillard³, Kouka Amed Jérémy Ouedraogo⁴, Claudiane Ouellet-Plamondon⁵, Elodie Prud'homme⁶.

¹ Université de Toulouse, UPS, INSA, LMDC (Laboratoire Matériaux et Durabilité des Constructions), Toulouse, France, jean-emmanuel.aubert@univ-tlse3.fr

² CERIS and Universidade NOVA de Lisboa, Caparica, Portugal

³ CTMNC, Research and Development Department of Ceramic, Ester Technopole, Limoges, France

⁴ Université de Toulouse, UPS, INSA, LMDC (Laboratoire Matériaux et Durabilité des Constructions), Toulouse, France

⁵ École de technologie supérieure, Université du Québec, Montreal, Quebec, Canada

⁶ Université de Lyon, MATEIS, Matériaux: Ingénierie et Science

Abstract

The objective of this chapter is to present the physical, geotechnical, chemical and mineralogical characterization techniques used to characterize the raw material (earth and mineral addition, such as sand and gravel) contained in the earth materials manufactured with different techniques: earth bricks, rammed earth or cob. This chapter will be divided into 6 sections. The first will present the method used to find the references considered in this state of the art and we will carry out a general qualitative analysis of these references. The other sections will deal respectively with granular, geotechnical, chemical and mineralogical characteristics and, finally, the last part will be dedicated to field tests.

Keywords: Particle size distribution, physical and geotechnical characterization, chemical and mineralogical properties, field tests.

2.1. Introduction

Earth has always been used by man to build his habitat. Until the middle of the 20th century, it was the most used building material with stone and wood. After the Second World War, concrete came to replace these materials, especially in western countries, thanks to its properties: speed of curing coupled with ease of mechanization of implementation, low cost, high mechanical performances and good durability. Concrete made from aggregates (mostly from natural origin), cement and admixture is being used at a fast rate worldwide. If cement did not pose any environmental problems (in particular because of its carbon footprint due to the significant CO₂ emission during its production), it is unlikely that researchers will once again be interested in natural materials, such as earth, as an alternative to cementitious composites. But the dramatic ecological situation in which the world is at the beginning of the third millennium forces men to reconsider how they consume, and in particular how they build. Furthermore, cementitious traditional components, especially sand scarcity, more and more highlights the economic effectiveness of using alternative available construction materials.