INTERNSHIP

/// Research Assistant – **Identification Of The Mechanical Behaviour Of Rammed Earth Under The Influence Of Water Content And Dry Density**

Type of contract: Internship (6 months)
Planned start date: April 2025
Location: Metropolis of Lyon
Working languages: French, English
Bonus: in accordance with current French legislation

Keywords: Low-tech, Rammed Earth, Experimentation, Compressive Strength, Research

Figure 1 - La Maison pour Tous, 2018, Four (38080, France). Client: Municipality of Four; Project Manager: Onsite Architecture; Construction: Atelier Kara (Timur Ersen)

BACKGROUND

The urgency prompted by the climate crisis and its harmful impacts on health and life necessitates swift action. Buildings are a key leverage point in decreasing greenhouse gas (GHG) emissions, yet the embodied emissions linked to their construction, primarily

stemming from extensive cement and steel usage (1), often remain a concealed challenge to any ambitious mitigation strategy (2).

As locally available, unprocessed, and potentially low-tech, raw earth is a promising construction material providing both low embodied carbon and favourable indoor comfort while fostering positive social impact (3). Rammed earth (RE) is one of the most prominent earthen building materials, employing as an in-situ construction technique, RE involves compressing dynamically layers of moist earth within formworks using a rammer.

Modelling is an essential tool for engineers to efficiently and cost-effectively verify the structural reliability of complex building projects. Despite the widespread use of the Finite Element Method (FEM), its application in the assessment of RE structures remains underdeveloped (4,5). Indeed, the constitutive mechanical laws of the materials require complex parameters for accurate analyses.

AIM

The aim of this study is to experimentally map the yield surface of an elasto-plastic mechanical model for RE under various stress paths. Additionally, the influence of dry density and water content on the yield surface will be addressed.

METHODOLOGY

The investigation will rely on a set of tests, including compression tests, extension tests and Brazilian tests. Samples will be tested at three different levels of water content and density to assess their behaviour under varying conditions.

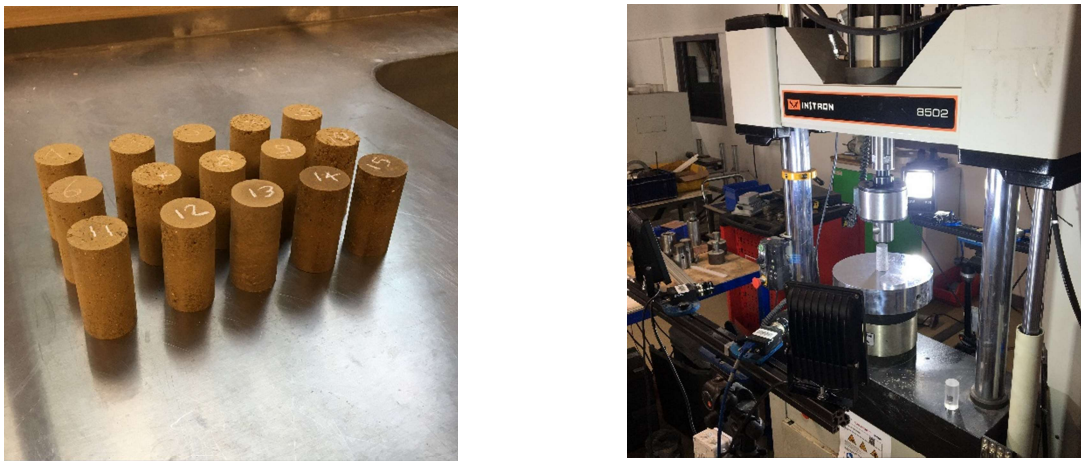

Figure 2 - (Left) Rammed earth cylindrical specimens. (Right) Specimen in unconfined compression test with DIC setup.

MISSIONS

1. **State-of-the-art**

Gather comprehensive knowledge based on leading papers relevant to the topic, and then contextualise the findings to justify the aim of your research.

2. **Experimental training**

Familiarise yourself with the experimental materials, tools and set-up with guidance from technicians and supervisors, in preparation for the testing campaign.

3. **Experimental campaign**

Carry out the planned experimental tests, ensuring accurate data collection.

4. **Analysis of results and recommendations**

Analyse the experimental results, and draw key conclusions.

PROFILE OF THE PERSON WE ARE LOOKING FOR…

- You have advanced training in mechanics of materials or civil engineering.
- You are deeply interested in sustainable construction.
- You thrive on experimentation.
- You are rigorous, proactive and have a strong capacity of synthesis.
- You can work independently.

RECRUITMENT PROCESS

- a 30-minute phone call,
- a meeting with the team.

To apply: We look forward to receiving your application by 17 March 2025 at Mathieu.Lecaille@entpe.fr. Please include your CV, along with a way to demonstrate your motivation —this doesn't necessarily need to be a cover letter.

CONTACTS

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REFERENCES

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