

A history of rammed earth in Asia

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Presentation outline

- About me
- Rammed earth
- North African rammed earth
- Asian rammed earth
- Movement of peoples
- Conclusions and questions

About me

- UK structural engineer
- Recently working in Sweden
- PhD 'Analysis of historic rammed earth construction' Durham University 2008. Treated rammed earth as an unsaturated soil
- Board member ICOMOS ISCEAH
- Director of Earth Building UK
- Maintain www.historicrammedearth.com website



Rammed earth

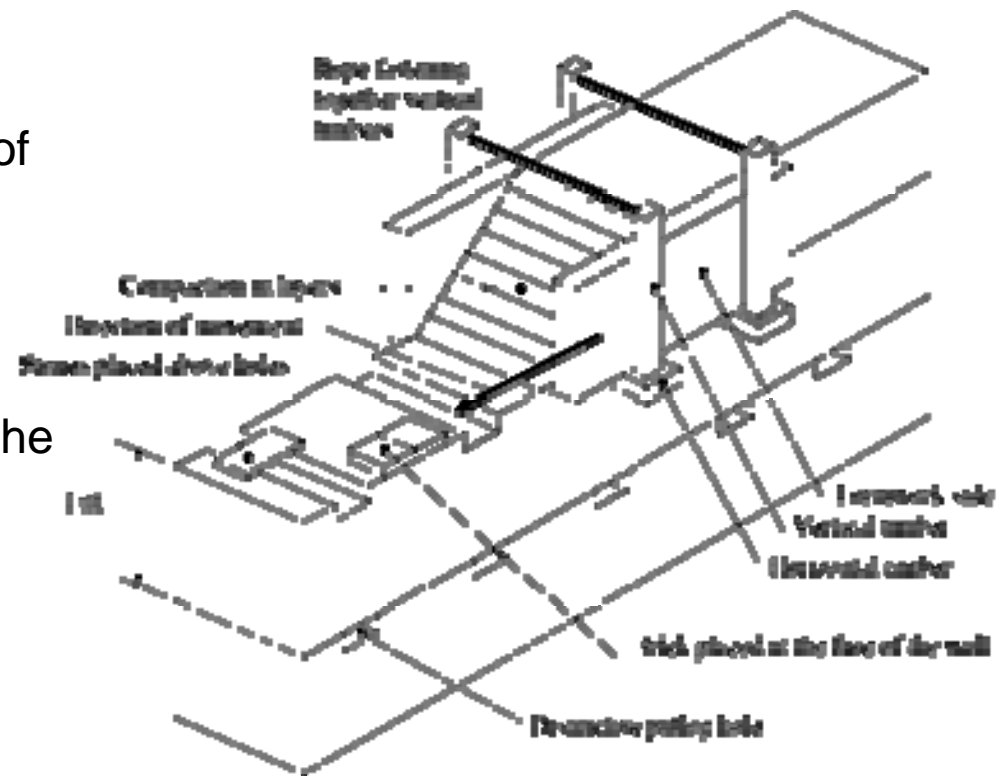
- Building technique and construction material
- Compact moist soil between formwork boards
- Water evaporates
- Formwork removed
- Leaves a monolithic wall



Dr Daniela Ciancio and a rammed earth wall in Perth, Australia

North African rammed earth

- Moveable formwork boards produced as boxes
- Supported through the body of the wall
- Each box filled with soil
- Formwork box moved along the wall, then up to the next level
- Technique used in Morocco, Europe, Pakistan and Afganistan



North African rammed earth

- Descriptions of historic technique
- Still used today in Morocco and northern India



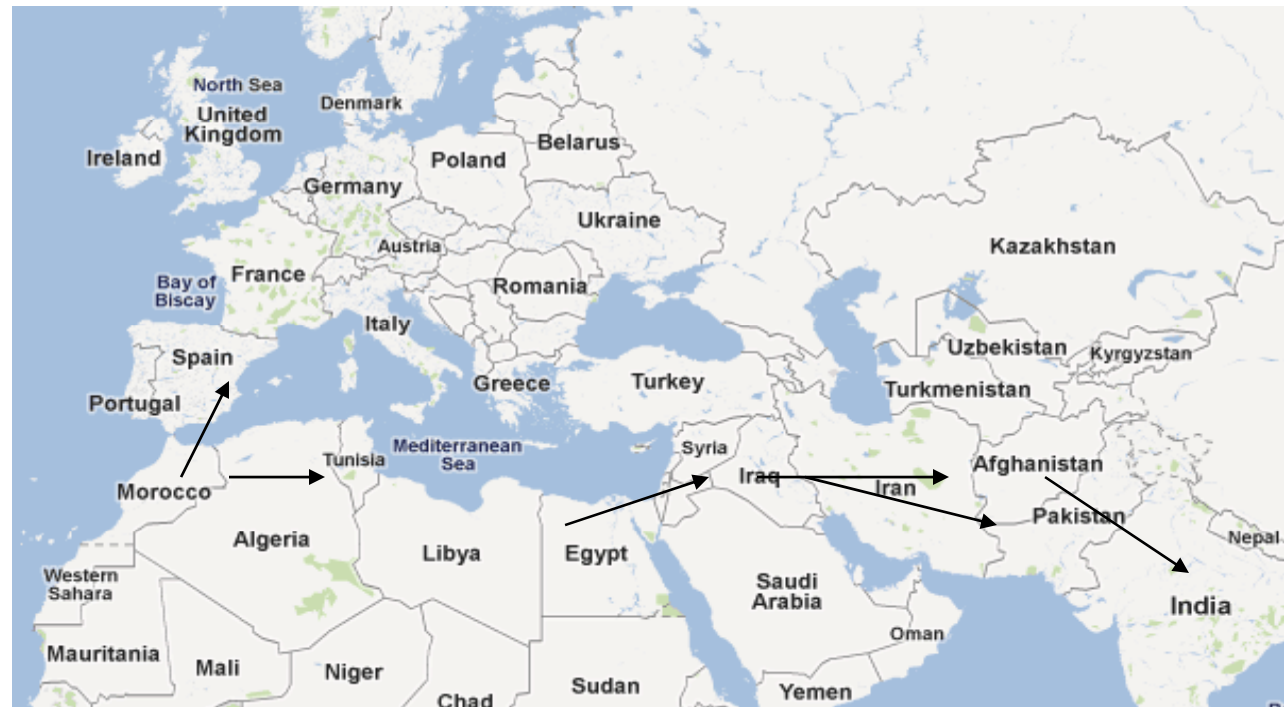
North African rammed earth formwork box. Asslim, Morocco.



Farsi manuscript detailing the North African technique. Pakistan 1860

North African rammed earth spread

- Rammed earth distribution seems to follow the expansion of the Islamic Caliphate 634AD onwards
- Technology spread with the movement of peoples, but with the decline of the Caliphate extent, the techniques did not stop



Spread of rammed earth from North Africa

North Africa

- Thousands of examples in Morocco
- Characteristic 'putlog' holes in the walls
- Joints between formwork boxes
- Also found in Spain and France



Biar castle, Spain



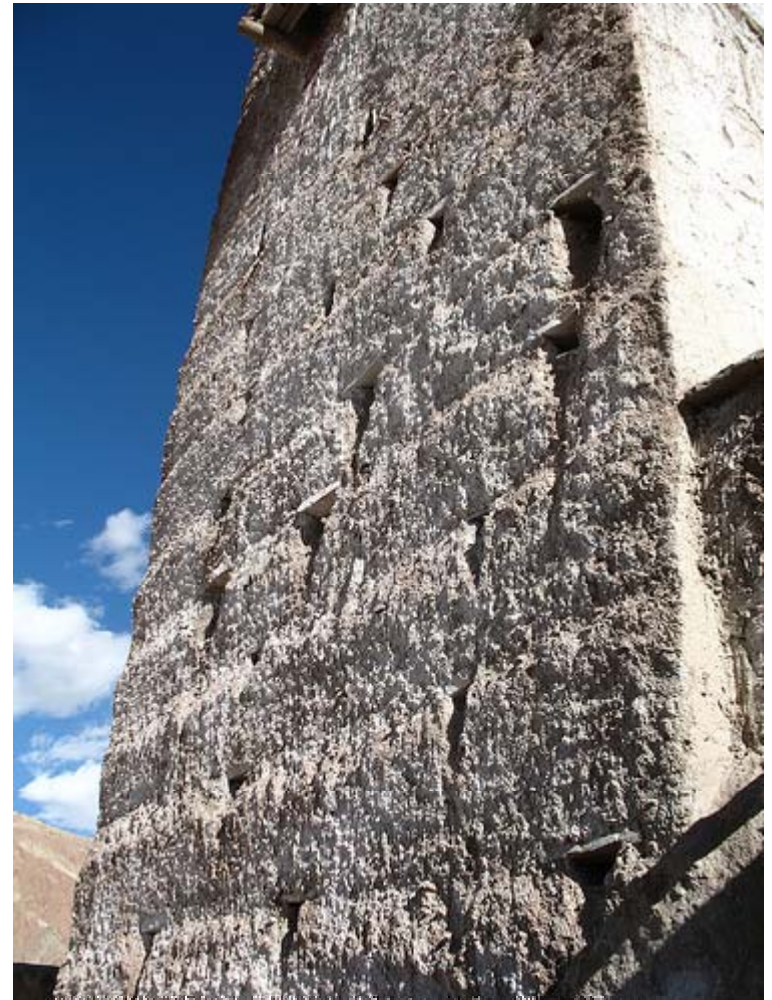
El Badi Palace. Marakesh. Morocco

North African rammed earth in Asia

- Rammed earth is stepped, but built using north African sytel formwork
- This is the oldest rammed earth in the region
- As now, Pakistan region was Islamic, Nepal and Ladakh were Buddhist, and the region switched rulers often



Kag Chode Thupten Samphel Ling,
Mustang, Nepal, built around 1430



Basgo Monastery, Ladakh, built
around 1450 AD

Modern north African technique

- Rammed earth still used as a vernacular construction technique in the Himalayas
- Technique the same as that used in North Africa
- Similar 'modern' rammed earth construction found in Nepal and Ladkh (northern India)



Part constructed rammed earth house in Bhutan

Asian rammed earth technique

- Long poles fixed to the ground
- Thinner horizontal formwork than North African technique
- Produces a continuous wall with no joints
- Possible to easily produce curver (Hakka)
- Written examples



Joseph Needham - Science and Civilisation in China

Asian rammed earth

- Poles fixed at the ground
- Small formwork boxes filled at each time



New rammed earth wall. Mustang region, Nepal



New rammed earth wall, Xi'an. Courtesy of Satprem Maini, Auroville Earth Institute

Asian rammed earth

- Still being used as a modern construction technique
- Construction of the whole level in one go
- Move round then up the building
- Large teams of people involved



New rammed earth construction. Zhongdian County, Yunnan.

Movements of peoples

- Spread of the technique with the construction of the great walls
- Construction of buildings across Tibet, and over the Himalaya
- Movement of the Hakka people south



Movement of the Asian rammed earth technique

Meeting of peoples

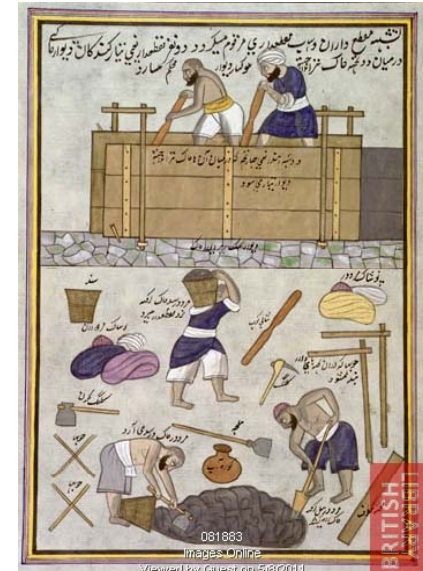
- Ladakh shows signs of both types of earthen construction
- Left – putlog holes to support formwork – North African
- Right – formwork supported externally – Asian
- Ladakh a melting pot of cultures, and has had both Asian and North African rulers



Namgyal Tsempo, Leh, Ladakh

Conclusions and questions (1)

- Two definitely different rammed earth techniques for formwork support
- One appears to have come from North Africa, the other from China
- What are the reasons for these different techniques? Timber availability and quality? Workforce availability?
- Is it possible to identify different rammed earth architecture, or are the techniques too locally varied?



Conclusions and questions (2)

- Techniques may have developed independently
- Absence of evidence is not evidence of absence. We might not have found it.
- Little research into the specific rammed earth techniques and architecture in Asia
- Are there historical records of Asian rammed earth building?
- Where do the Hakka techniques fit
- For more information about rammed earth history, buy my book!

