

CONSTRUIRE EN TERRE. Du patrimoine historique à l'architecture contemporaine

Des professionnels, des savoir-faire et des techniques en Europe

Marseille, Hôtel de Région - 4 & 5 mai 2011

BUILDING WITH EARTH. From Cultural Heritage to Contemporary Architecture - Marseille, Hotel of Region - 4 & 5 May 2011

Earth as a construction material

- Heterogenous
- Variety of techniques
- Other uncertainties (weather factor, use of additives or not etc)

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What does a standard intend to do?

- Provide construction guidelines
- Define acceptable deficiencies
- Define tests for its properties, including structural ones

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What a structural engineer need to know?

- Compressive and shear strength (masonry and masonry unit)
- Mortar properties
- Ductility, failure mechanism, behaviour in out-of-plane loads

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Brazil

- Stabilised adobe and rammed earth
- Only non-load bearing walls
- Few construction guidelines
- Little mention to structural properties

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New Mexico

- Rich in construction guidelines
- All type of earthen construction
- Load bearing and non-load bearing walls
- Structural properties: compressive strength

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Spain

- Only CEB
- Geometrical characteristics
- Compressive strength test
- Horizontal and vertical reinforcement

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Peru

- High seismic-risk area
- Only adobe
- Involves not only the masonry unit, but also the masonry as a whole
- Compressive strength test
- Shear strength test
- Horizontal and vertical reinforcement

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New Zealand

- High seismic-risk area
- Adobe, rammed earth and CEB
- Involves ductility
- Sophisticated methodology, very rich in construction guidelines

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| Guideline | type | Features | Legal status | Structural properties mentioned | Other tests | Seismic risk in the area |
|------------------|--|--|---------------------------|---|--|--------------------------|
| Peru | adobe | construction guidelines, soil selection | Part of the building code | Masonry's compressive and shear strength | | High |
| Spain | CEB | geometrical description | Standard | masonry unit's compressive strength | humectation and freezing cycles, erosion, water absorption | Medium |
| New Zealand | adobe Pressed brick Rammed earth | soil selection, construction guidelines | set of standards | ultimate limit state seismic out-of-plane resistance of masonry | | High |
| Brazil | cement-stabilised CEB, rammed earth (non load-bearing) | geometrical description, soil selection, construction guidelines | set of standards | masonry unit's compressive strength | water absorption | Low |
| New Mexico (USA) | All types | definition of each type, construction guidelines | regional standard | compressive strength | | Low |

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Conclusion

- Lack of information to design bearing walls especially in high-seismic risks areas

Necessity of a Eurocode (or something similar) for earthen buildings

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Engineers of the earth and earth building

- wooden frame for adobes and .pdf with guidelines sent to the people of Gaza 2010



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Engineers of the earth and earth building

- workshop-presentation of earthen building techniques in an ecological festival. Athens 2010



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Engineers of the earth and earth building

- exploring legal status of earthen construction in Greece and worldwide

All of them working with other groups of architects and earth building enthusiasts!