

Re-discovering Traditional Mortars in Scotland

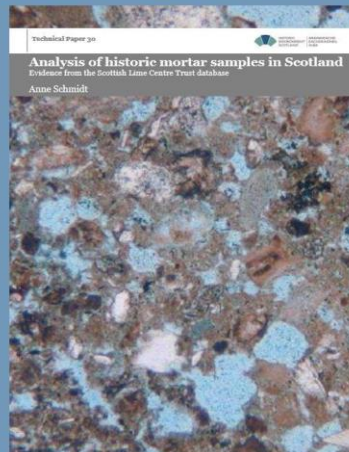
HES research update



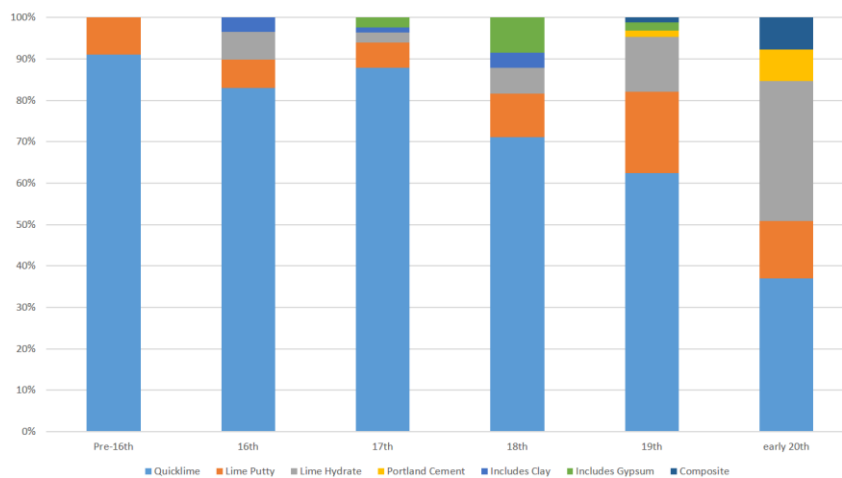
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Mortar Analysis

- Analysis of >3000 samples held in the Scottish Lime Centre Trust database
- The spread and frequency of lime binders
- The lime to aggregate ratio
- The hydraulicity of the mortar
- significant additives
- The influence of region and climatic differences



Binder type use per century



This graph shows the evidence from the samples giving an indication of the predominance of the use of quicklime binders up until the mid 19th century. Blue shows the percentage of samples with quicklime as the binder.

The samples include bedding, pointing, harling, ashlar, plaster and render. If you divide up these functions the majority of bedding, harling and pointing mortars are quicklime based, with the use of putty limes increasing for ashlar and plaster functions.

The relative absence of clay binders is notable, possibly because these components were overlooked in analysis, and the use of putty limes is an indication partly of the plaster samples and partly due to the identification of slaked lime as putty (round inclusions).

What does the science tell us?

Hot-mixed lime mortars:

considerations on microstructure and functional performance

- Identifies the role of lime mortars in wicking away moisture (and salts) from the masonry substrate (sacrificial)
- Suggests lime-rich, non or feebly hydraulic quicklime mixes exhibit this function most effectively
- Suggests increasing hydraulicity and lower binder content result in a reduction in functional performance
- Concludes that hot-mixed mortars are the only practical means of replicating the historic mix-constituents at the historic proportions



HISTORIC
ENVIRONMENT
SCOTLAND

ÀRAINNEACHD
EACHDRAIDHEIL
ALBA

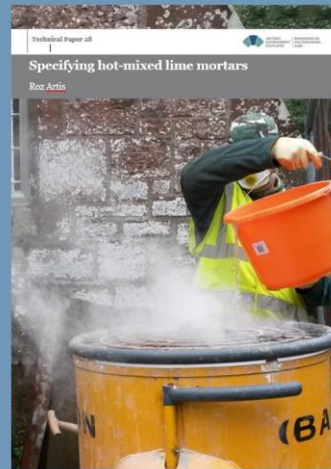
What does the written evidence tell us? Historic texts relating to hot-mixed mortars in Europe 1400-1900

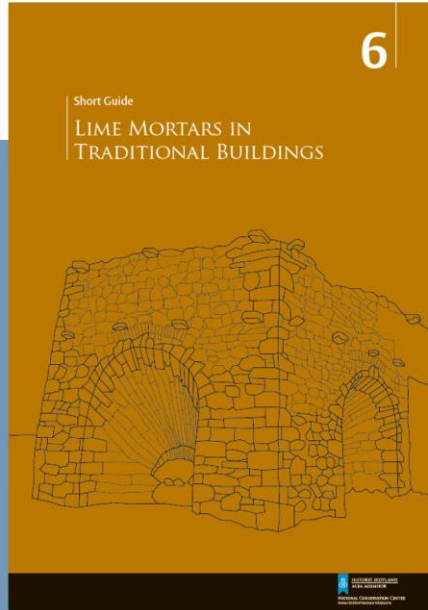
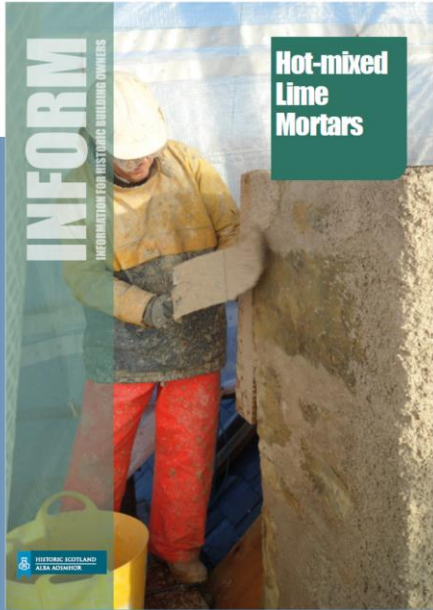
- Texts from 60BC – 1955
- 200+ extracts from European sources
- comprehensive review of existing literature
- Mortars were lime rich and hot-mixed
- Hydraulic lime binders not routinely used above ground
- Highlights the need for training



Specifying hot-mixed lime mortars

- Standards of specification in general are poor
- Specification of *all* lime mortars requires skill and understanding
- It is easier, and less risky (?) to specify a ready-mix
- Hot-mixed mortars are currently the preserve of a small (but growing) number of craftspeople and specifiers





Conclusions

- Hot-mixing mortar is historically authentic
- The archival evidence supports the use of hot-mixed mortars
- Mortar analysis shows most mortars were mixed this way
- Scientific evidence suggests hot-mixing improves performance characteristics
- Surviving examples demonstrate their durability
- Modern examples demonstrate their current relevance

- Better training is required – this is an opportunity!
- Effort needs to be focussed on materials sourcing
- We must take health and safety seriously and promote exemplary standards