suhuha

Former Gas Holder Site, Balfour Place, St Andrews KY16 9RQ

Repairs to Historic Walls – Abbey Street (to boundary with Abbey Cottage and Balfour Place)

The historic walls surrounding the applicants site (as highlighted on the attached location plan) which represents to most South Easterly quarter of the St Andrews Cathedral & Priory Precinct. The walls around the site comprise approximately 100m of mass masonry rubble wall, with a corner tower doocot to the SE corner an arched entrance and dressed on Balfour Place.

The walls vary in height between approximately 4.5 and 6m high surrounding the site to the east and south.

The exposed wall head is a result of years of deterioration due to unclear ownership responsibilities. The applicant is not the owner of the wall but as owner of the site bounded by the wall they wish to fund the repairs required to secure the wall head. The exposed areas comprises a mix of historic lime based mortar bedded/pointed rubble rough racking, approximately 950mm wide over the entirety of the rubble walls.

The aim of this work is to minimise the risk of stone fall onto pavements and parking spaces from the wall heads above by rebedding localised high level loose masonry, and on all accessible faces, weed killing and cutting back/treating tree/shrub growth, and localised repointing of open and joints to prevent re-growth.

It is anticipated that the walls will be accessed from a mobile access platform or lightweight portable scaffolding from the inside face within the applicants ownership boundary, where the work can be carried out without impacting on neighbouring properties or public areas.

All works, including mortar mixing, must be segregated behind herras fencing or similarly approved barriers. For the purposes of programme, it is anticipated that the nature of the works will require sufficient labour on site to complete an average of 10m of wall in one full working day - working around the boundary walls on a rolling basis, with access and fencing established each morning and removed again at night.

The appointed contractor will be responsible for all traffic management and/or temporary pedestrian routes and for returning and developing the attached Pre-construction Information into a Construction Phase Plan, including providing control measures, risk assessments and method statements for the hazards identified to meet the Construction Design Management (CDM) 2015 regulations. Although it is not expected that a traffic management plan is required due to the position of the works and the timing in sequence with the site compound for the larger ongoing works within the applicants site.

A copy of the appointed contractors Health and Safety Policy should be appended within the Developed Construction Phase Plan.

Scope of Works

The works are to be carried out from within the applicants ownership boundary via a mobile working platform and/or lightweight self supported scaffolding.

The site set up, welfare and H&S will be under the current main contract for the construction of 5 new 2-storey houses under planning application 23/02628/FULL and SMC 300072868.

Prelims:	Set up perimeter fencing / hoarding / notification for protection of public from falling debris from above.
Downtakings:	Removal of high level loose masonry, loose mortar, vegetation, tree and shrubbery roots using hand held non mechanical traditional masons tools, from within the top 300-500mm of the wall head. Stones set aside for replacement in same positions for re-build. Metal works from turret removed.
Masonry:	Re-bed & point using 1 part NHL 2 hydraulic lime mortar 1part local building sand & 1 part local sharp sand. All rebuilt stonework to be suitably protected during mortar curing process. Consolidate / cap wall head to decelerate re-growth of vegetation with 1part modified Hydraulic lime such as Saint Astier Tradiblanc / 3parts local sharp sand bag rubbed to a smooth finish.
Misc:	Turret mesh canopy re-constructed and installed in same position and height to prevent pests into Doocot Turret 'door' cast iron gate to be repaired and re-instated.

Mortar Analysis Report

Boundary Walls to Former Gas Holder Site, Balfour Place, St Andrews Fife

Site	Boundary walls
Client	Eastacre St Andrews
Date Sample Received	5 August 2025
Analysis Dates	5 August 2025 – 27 August 2025
Client Requirements	Visual analysis and acid digestion to determine mix proportions to inform an appropriate repair mortar.
Structure Type	Mass masonry boundary wall
Location/ Function	Pointing/Bedding Mortar from boundary wall
Condition of Sample	Four lumps of intact mortar. Total weight c.450g.

Analytical Procedures

- The selected sample of mortar was dried and visually examined under a hand lens.
- Degree of carbonation of the sample was determined using phenolphthalein indicator.
- A sample of mortar was dried, lightly crushed to disaggregate the binder and aggregate, weighed and dissolved in 10% Hydrochloric acid to allow the proportions and characteristics of insoluble components to be determined.
- A small sample of local beach sand was dissolved in 10% Hydrochloric acid to allow its characteristics to be compared with the aggregate from the mortar sample.

Visual Examination

- The sample was received was fully carbonated.
- The samples tested were in-tact, not friable, very hard and difficult to break by hand.
- The binder was strong and cohesive throughout.
- The mortar was found to be 10YR 6/2 ‘light brownish grey’ when viewed against the Munsell Soil Colour Charts.
- The mortar contains lime inclusions up to 2mm, shells and burnt wood/coal fragments throughout and coarse grained aggregate up to c.4mm.
- The binder is evenly distributed through the sample.
- The mortar experienced a moderate to fast water absorption rate when subjected to the water droplet test. This fast water absorption rate indicates an interconnected internal pore structure that is well connected to the surface.

Acid Dissolution & Filtration
On addition of the 10% hydrochloric acid to the sample there was a strong reaction, with foaming and steam produced. The sample continued to react strongly after pouring off the overburden and applying further acid over the next 5 days.

Initial results from analysed sample

MATERIAL	WEIGHT (g)	COMMENTS
Dry weight of analysis sample	107	Mass of sample analysed (before acid digestion).
Dry weight of insoluble component	40	Insoluble component recovered after acid digestion. Includes aggregates, unburnt coal/wood and ash fragments and insoluble residues from binder.
Dry weight of soluble component	67	Including soluble binder (lime)and soluble aggregate (shell and lime inclusions)

Aggregate Characterisation

The aggregate isolated from this sample is medium to coarse grained (up to c. 4mm) and appears well graded, with an even distribution of particle sizes. The sample contains a range of angular, sub-angular to sub-rounded course grained rock fragments, with a high proportion of fine quartz particles. Given the structures close proximity to the shore and the high proportion of shells identified in the mix prior to acid digestion, the sand used in the mortar analysed is likely to have been obtained from the nearby beach.

To allow a comparison, 10% hydrochloric acid was added to a small sample of dried local beach sand to establish the proportion of soluble aggregates, such as shell.
As with the mortar analysed, there was a strong reaction, with foaming and steam produced. The sample continued to react strongly after pouring off the overburden and applying further acid over the next 3 days.

Results
- Dried weight of beach sand sample before acid digestion = 63g
- Dried weight of insoluble aggregate following acid digestion = 28g.
- Weight of soluble component = 35g
- Approximate % soluble component = 55%

The insoluble aggregate isolated from this beach sand sample has similar characteristics to the mortar

sample - medium to coarse grained, moderately well graded, even distribution of particle sizes, range of angular, sub-angular to sub-rounded course grained rock fragments, with a high proportion of quartz finer particles.

To replicate the original aggregates used, due to the commecial unavailability of a matching beach sand, it is recommended that local concrete sand from Angle Park Quarry is mixed with crushed shells.

Detailed results from analysed sample

MATERIAL	WEIGHT (g)	COMMENTS
a. Dry weight of analysis sample	107	Mass of sample analysed (before acid digestion).
b. Dry weight of insoluble component	40	Insoluble component recovered after acid digestion. Includes aggregates, unburnt coal/wood and ash fragments and insoluble residues from binder.
c. Approximate weight of binder residues in insoluble component	2	Reactive clays contained within limestone.
d. Approximate weight of other residues in insoluble component.	1	Unburnt coat/wood and ash residues
e. Approximate dry weight of insoluble aggregate component = b-(c+d)	37	Coarse grained up to c.4mm
f. Dry weight of soluble component	67	Including soluble binder (lime)and soluble aggregate (shell and lime inclusions)

= a-b		
g. Approximate weight of soluble aggregate (based upon analyses of local beach sand which comprised 55% soluble material)	41	Soluble aggregate (shell and lime inclusions)
h. Dry weight of active binder = f-g	26	Including 2g insoluble binder
i. Total dry weight of aggregate (insoluble + soluble) = e+g	77	37g insoluble + 35g soluble
Other	1	Ash/coal/wood fragments

SUMMARY AND INTERPRETATION OF ANALYSIS RESULTS

- The mortar analysed appears to consist of a hydraulic lime binder prepared as a 'hot mix lime mortar' by slaking quicklime and sand together in one operation, or by air slacking the quicklime to a rough powder prior to (or during) mixing with the sand.
- The hardness of the mortar and residues contained within the insoluble component retained after acid digestion suggests a feebly to moderately hydraulic lime. The inclusion of shells and ash residues in the mortar will have added complexity and durability to the mortar.
- The aggregate derived from the mortar after acid digestion has similar characteristics to local beach sand. The beach sand analysed comprised 55% soluble aggregate such as shell.
- When this percentage is taken into account, the binder/aggregate ration of the mortar analysed is in the region of 1 part lime to 3 parts beach sand by weight.
- This equates to 1 part feebly/moderately hydraulic lime mortar to 1.4 parts beach sand by volume. This includes the presence of lime inclusions which would not have contributed as an active binder component. Instead the inclusions (and the shells) added complexity to the mortar, with current research suggesting that the presence of calcareous aggregates promotes carbonation in traditional lime mortars enabling a quicker and more thorough set resulting in greater durability.

To replicate the characteristics of the mortar analysed, the following mix proportions are recommended by volume:

0.5 part	non hydraulic 5mm kibbled quicklime 1 part NHL3.5 Natural Hydraulic Lime
3 parts	Angle Park Concrete Sand
1	part crushed shell aggregate (0 to 4mm)

Note:
- the addition of a small quantity of wood ash will add complexity and aid colour matching to the original mortar
- for exposed areas consider changing the hydraulic component to NHL5