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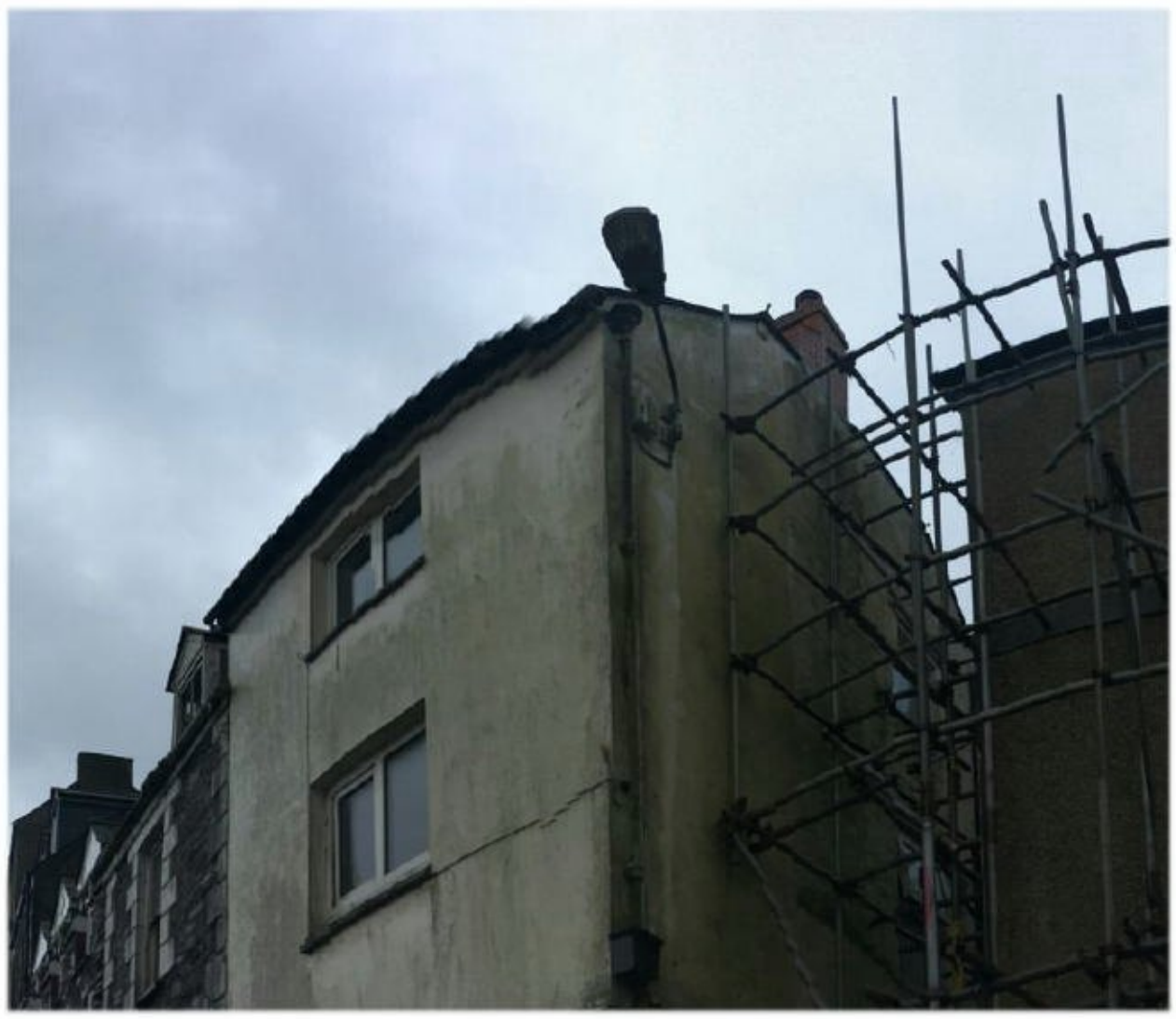
CHARTERED STRUCTURAL SOLUTIONS

Report on Structural Condition



No. 15 Polkirt Hill

Mevagissey

PL26 6UR

Cornwall

J21/211 Rev B
February 2021

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INDEX

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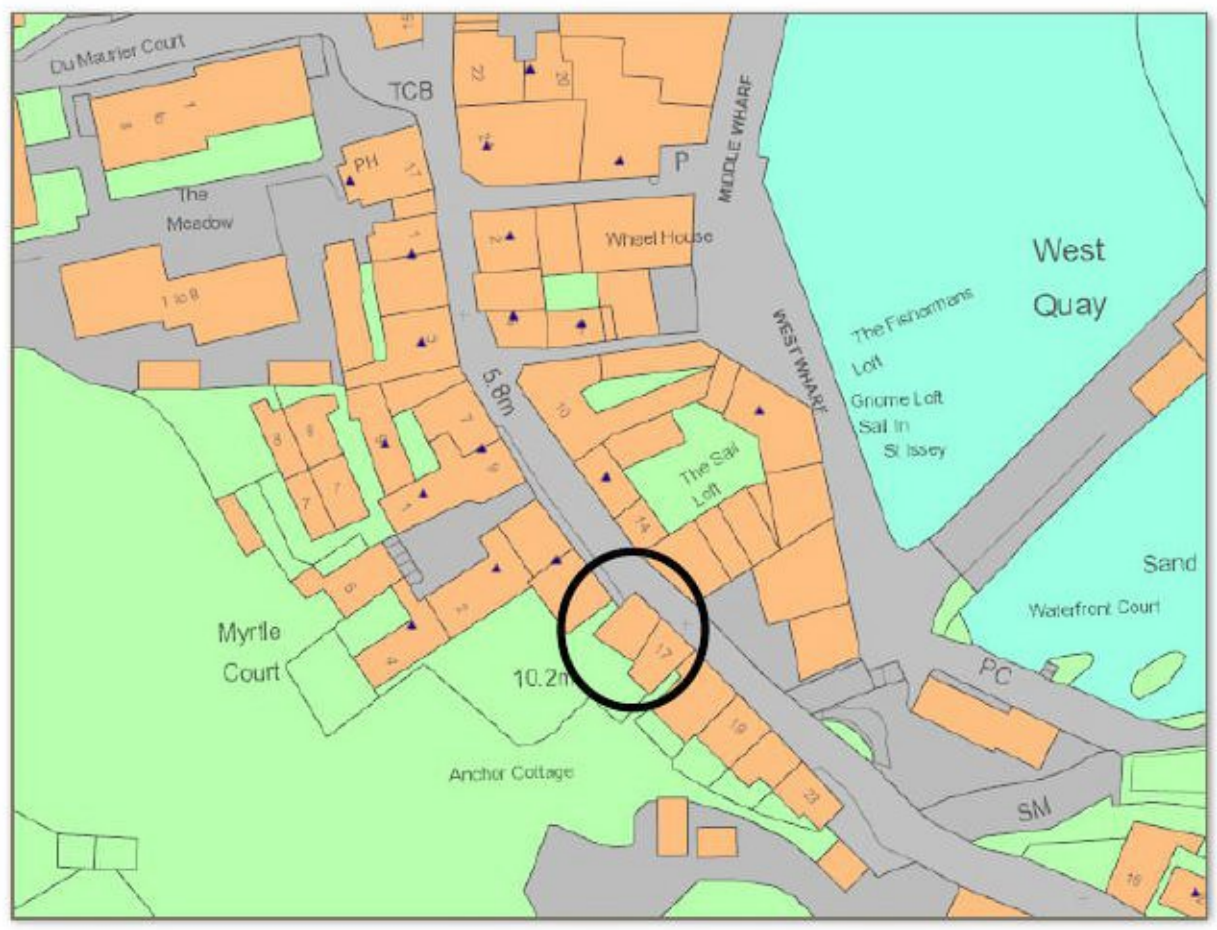
1 SCOPE AND PURPOSE OF THE STRUCTURAL INSPECTION

1.1 RCSSS Chartered Structural Solutions have been instructed by Frits Sutmoller to provide a structural inspection and a condition assessment of No 15 Polkirt Hill, in Mevagissey near St Austell. The site visit inspection was carried out on 13th February 2021.

1.2 During the site inspection, displacement recording marks were found in the building; it is unknown whether the originator of such marks or HSE or CROSS has been notified about the building condition. This report aims to clarify matters with regards to the recommended demolition of the building.

1.3 This report has been prepared following guidelines by Structural-Safety.org (IStructE, ICE, HSE) formerly SCOSS, topic papers No.37 'The durability of structures and their components, and a clearer meaning of 'lifespan', and topic paper No. 44 covering the interface between local authority building control and HSE.

1.4 CROSS, also part of Structural-Safety, has published many reports of wall collapses. It is clear that many agents in the construction industry fail to grasp the potential risks of failure, and the consequences can follow: deaths and serious injuries. Under CDM, there are responsibilities during demolition to ensure stability at all times.



Plan-Picture 1 Property location in Mevagissey

2 STRUCTURAL INSPECTION

2.1 SHALE STONE AS A BUILDING MATERIAL

The original construction was formed by a single storey level built with shale combined shale and rubble stone walls. Shale is a very ornamental stone type, often seen as an exposed element, forming low retaining walls with great architectural character. However, shale is also known for causing structural problems and being inadequate for placing demanding structural loads.

Granite is a very hard, granular, crystalline igneous rock that consists mainly of quartz, mica, and feldspar and is often used as building stone. Shale is a fine-grained sedimentary rock that is formed by the compaction of silt and clay-size mineral particles.

Thin shale walls have been a continuing occurrence of damage to floor slabs and abutting walls. The main reason is its internal interface, which can contain organic materials or a minimum degree of clays. Under some conditions (particularly humidity), it can lose most of its structural integrity. Formed thousands of years ago, clays were turned into shale rock, but some laminations and some of the chemicals present in clay are still present in shale rocks. These chemicals can react with water and grow crystals. As the crystals grow, they start to force the laminations apart, causing expansion of the rock itself. Walls exceeding a minimum thickness, generally over half a metre, are not affected by this phenomenon. In part, the techniques used during construction combine shale with other rocks and use a central core within the wall.

Picture 2 Shale rock

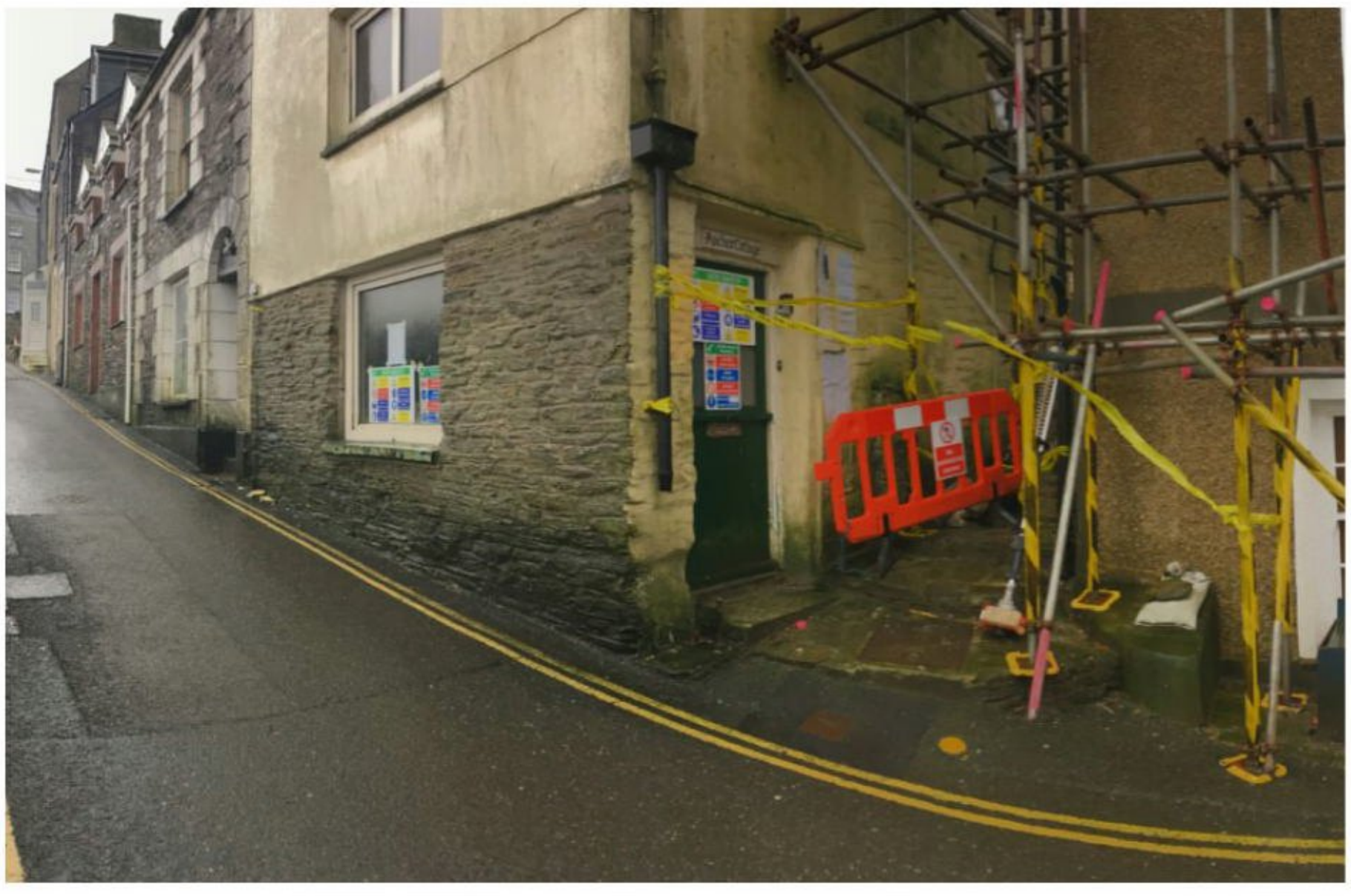
2.2 PROPERTY INSPECTION

The property is three storeys, plus a loft space. The property is adjacent to a house, No.17, built with larger rubble stones and granite quoins; the other side is facing an alleyway.
The property seems to have been built mid C19 and shows a concerning structural condition, particularly at the rear elevation with a partially sunken roof and a leaning outwards wall.
The quality of the construction seems to be diminishing while approaching the rear of the property. It must be noted that a thin shale wall is not a structural asset but a liability.

LATERAL ELEVATION

The lateral elevation, facing the alleyway, is built with a blockwork return from the front elevation and then there is a transition in the wall construction into a thinner shale-stone wall towards the rear end. The alleyway is occupied by scaffolding, which may transmit some loads onto the neighbouring property, No. 13, adjacent to another listed property.

The arrangement seems concerning, at least. Note the side elevation has been partially rebuilt at some point by using single skin blockwork only. Single skin blockwork is very slender to be placed in a multi-storey house. A single skin wall without wall ties by a roadside is a very precarious situation from the safety point of view, and impact from a vehicle would



Picture 3 Side elevation

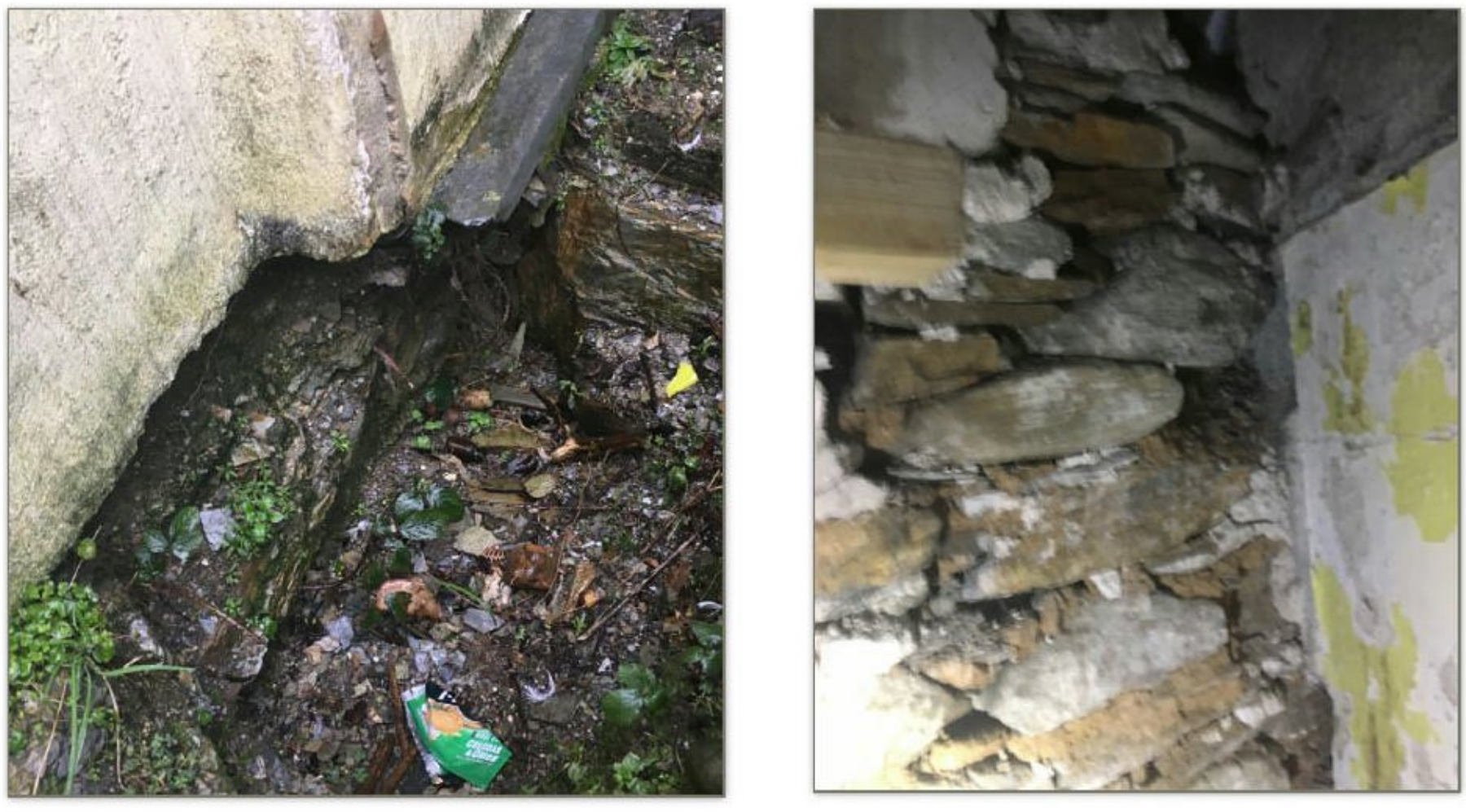
mean that the single skin wall would collapse on its entirety not having a cavity arrangement or ties. We have recently witnessed a blockwork wall collapsing in Truro dramatically after being hit by a delivery van while reversing as the wall had no wall ties. A terrible and poor situation from the safety point of view.

REAR ELEVATION

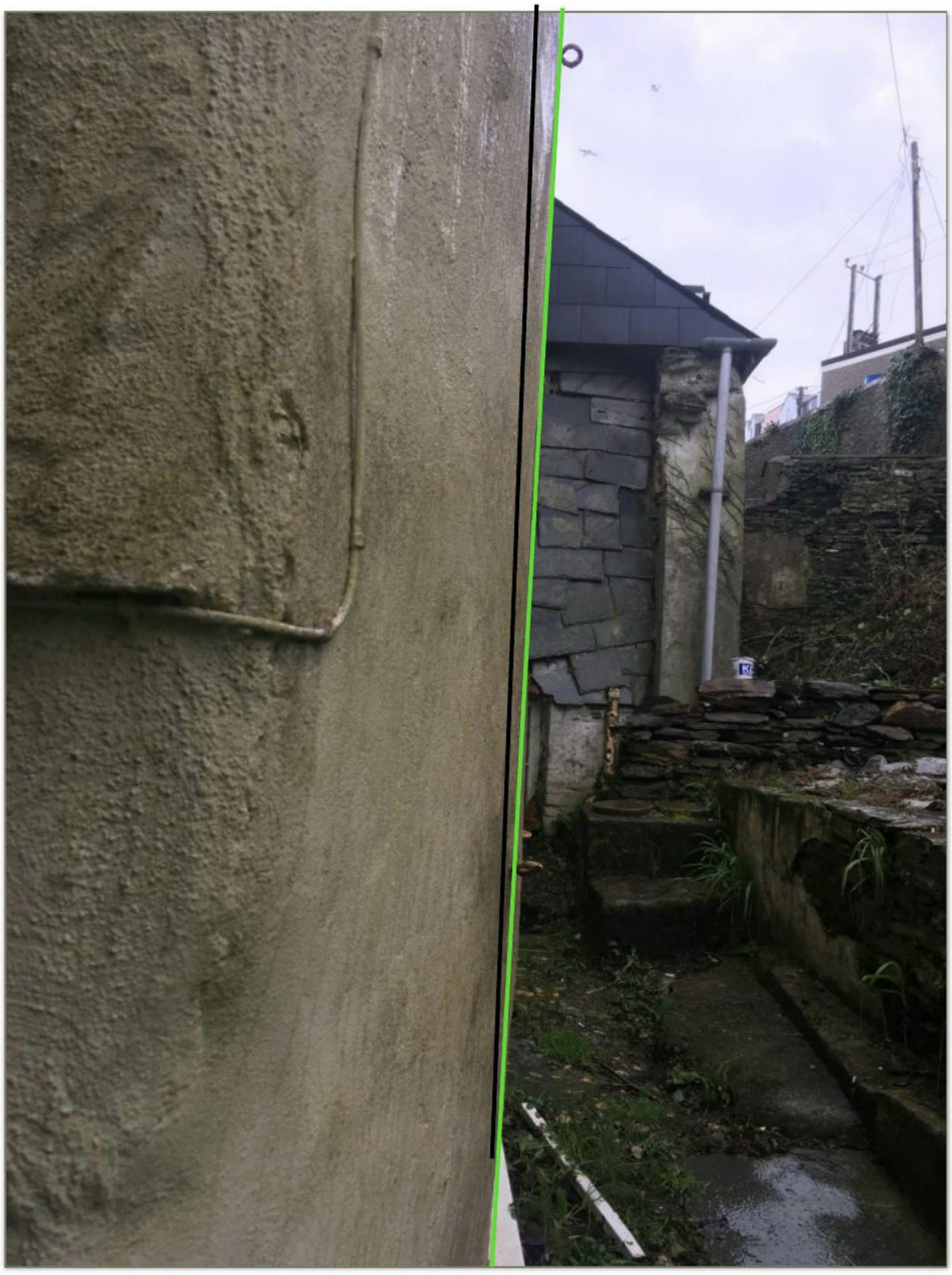
The rear elevation is rendered on its entire height and has no openings. There is a bell-cast joint in the render at 2/3 of its height. The roof is partially sunken. The rear wall elevation was built with a thinner shale-based stone. The wall is leaning towards the outside area. Its foundations are partly exposed at the back; rainwater can easily drain directly onto the foundations. The site is in a flooding risk zone for underwater movement.

The design life of the rear wall expired a long time ago. The foundations are not safe either, and there is a risk of the rear collapsing without warning. A building with beam members can be propped up into safety temporarily. There is no way to support a rubble wall from coming down. The alley wall elevation would also collapse if the rear wall did. The chimney was renovated at the higher level only and is not offering internal support. A gap was found.

The foundations at the rear are partly exposed and there is a large gap between the property walls and the ground. The ground slope arrangement, running towards the road at front facilitates water is pouring directly onto the foundations while hitting the rear of the house. Flood searches have been carried out and confirmed underwater flood risks.



Pictures 4,5,6 Wall - Ground to wall gap draining rainwater directly onto the foundations at the rear elevation. Unsightly wall construction within the rear elevation.



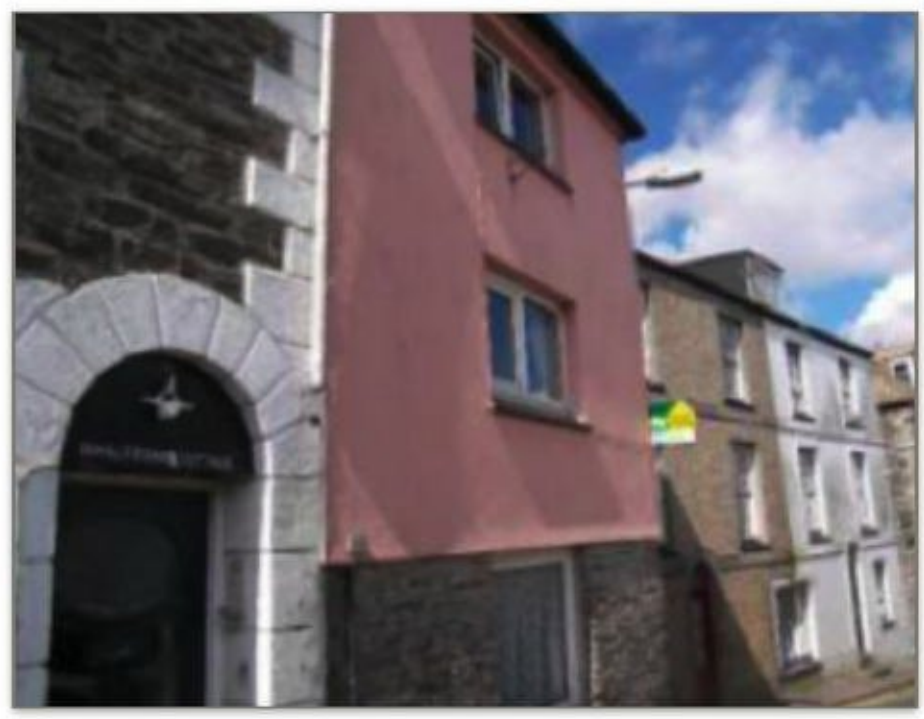
Picture 7 The rear elevation is leaning approximately 12 degrees
(Note the black line is not vertical)

FRONT ELEVATION

The front elevation shows a solid aspect. The lower stone wall has been built to an adequate thickness so that any shale-related issues will most likely be already resolved by providing an inner core made of smaller fragments, as a usual technique to build stone walls.

The party wall is a single wall partition on blocks, seems to have been partly removed. The internal party wall must be reconstructed to provide lateral stability.

The front elevation lower level was topped by block-work on flat and is structurally tied to the neighbouring property. There is no reason to demolish the front wall elevation. It would minimise any associated logistic issues of road closure and access. During construction, the wall's stability needs to be looked at in detail as part of a temporary works design. Keeping an external elevation, most likely the front one, is usual while renovating old buildings or carrying out partial demolitions.

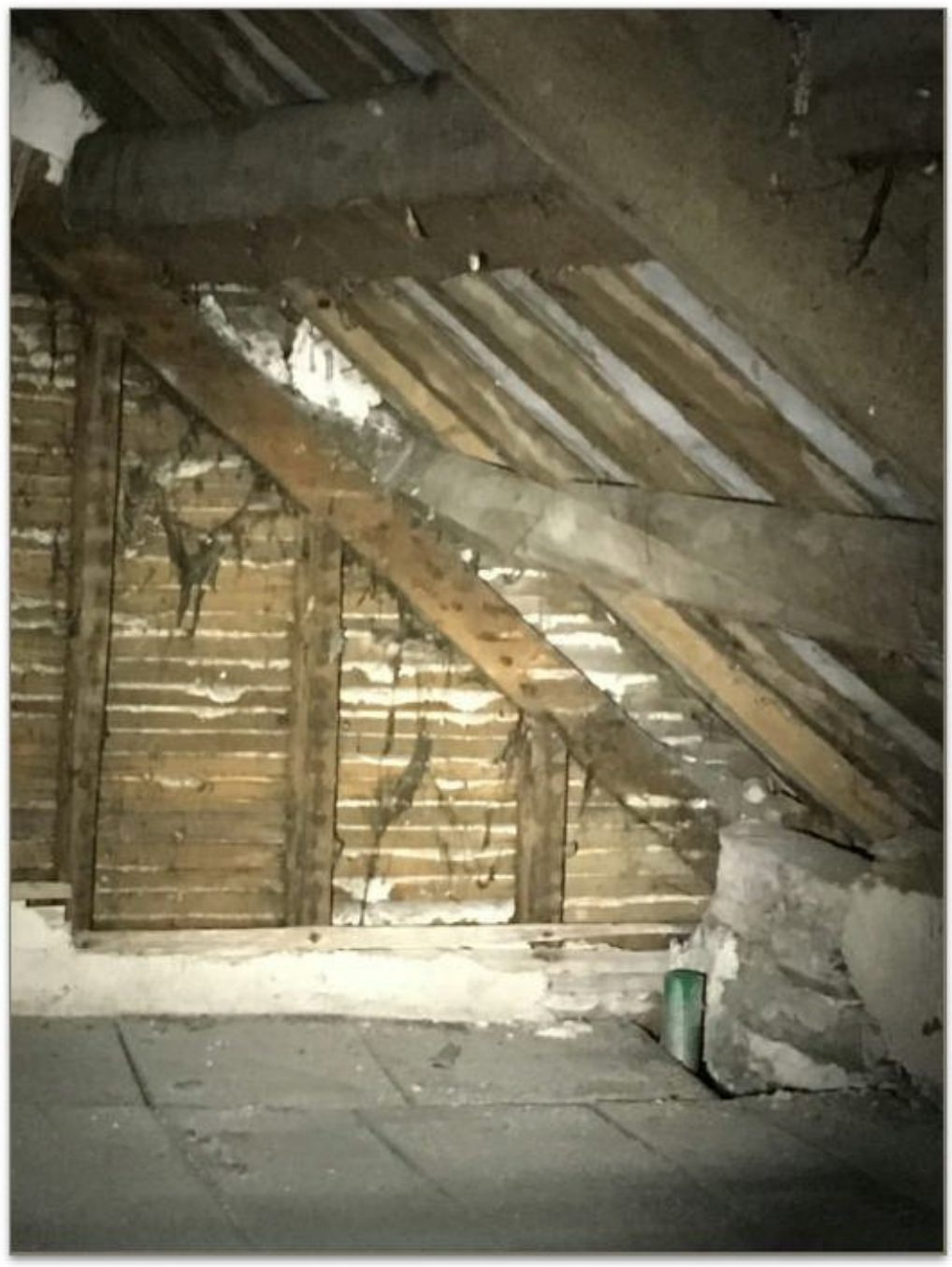


Picture 8 Old front wall elevation aspect while painted in pink

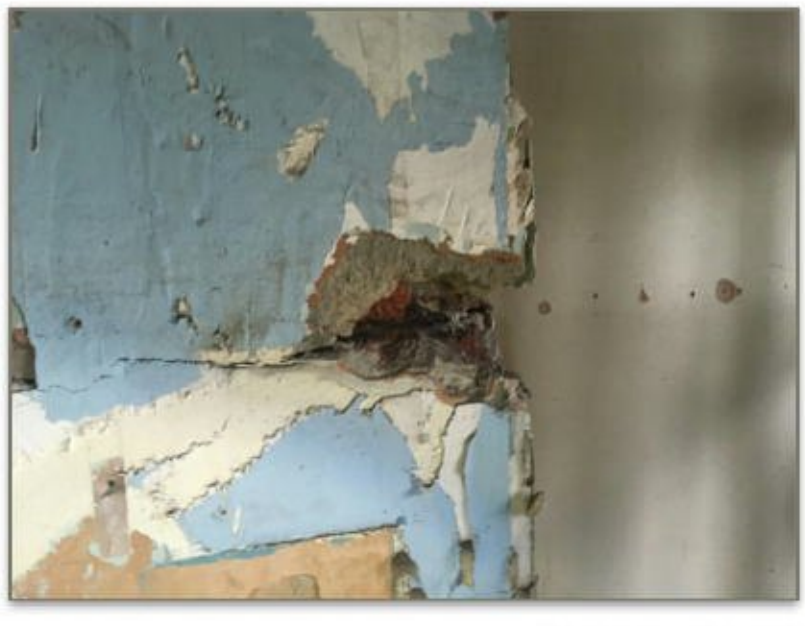
Picture 9 Front elevation. A recent picture free of structural damage

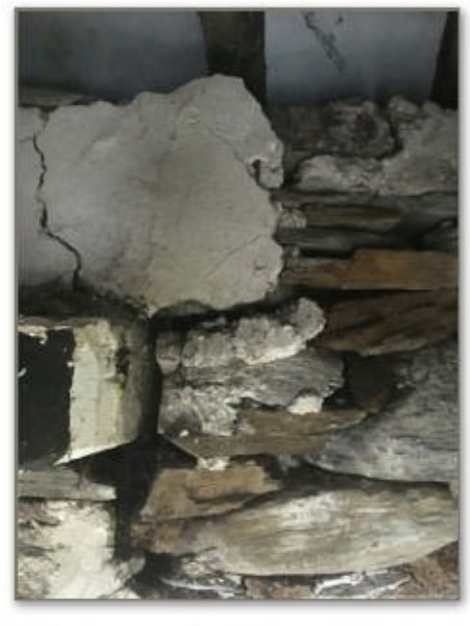
2.3 LOFT AND UPPER LEVEL INSPECTIONS

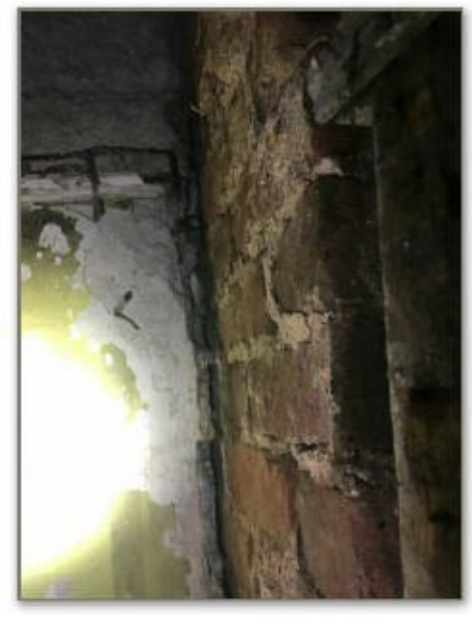
The upper part of the chimney stack has been renovated; together with installing lighter roof tiles, ten years ago approximately. That would have been a step in the right direction, and will have probably delayed the inevitable impending collapse of the rear wall.



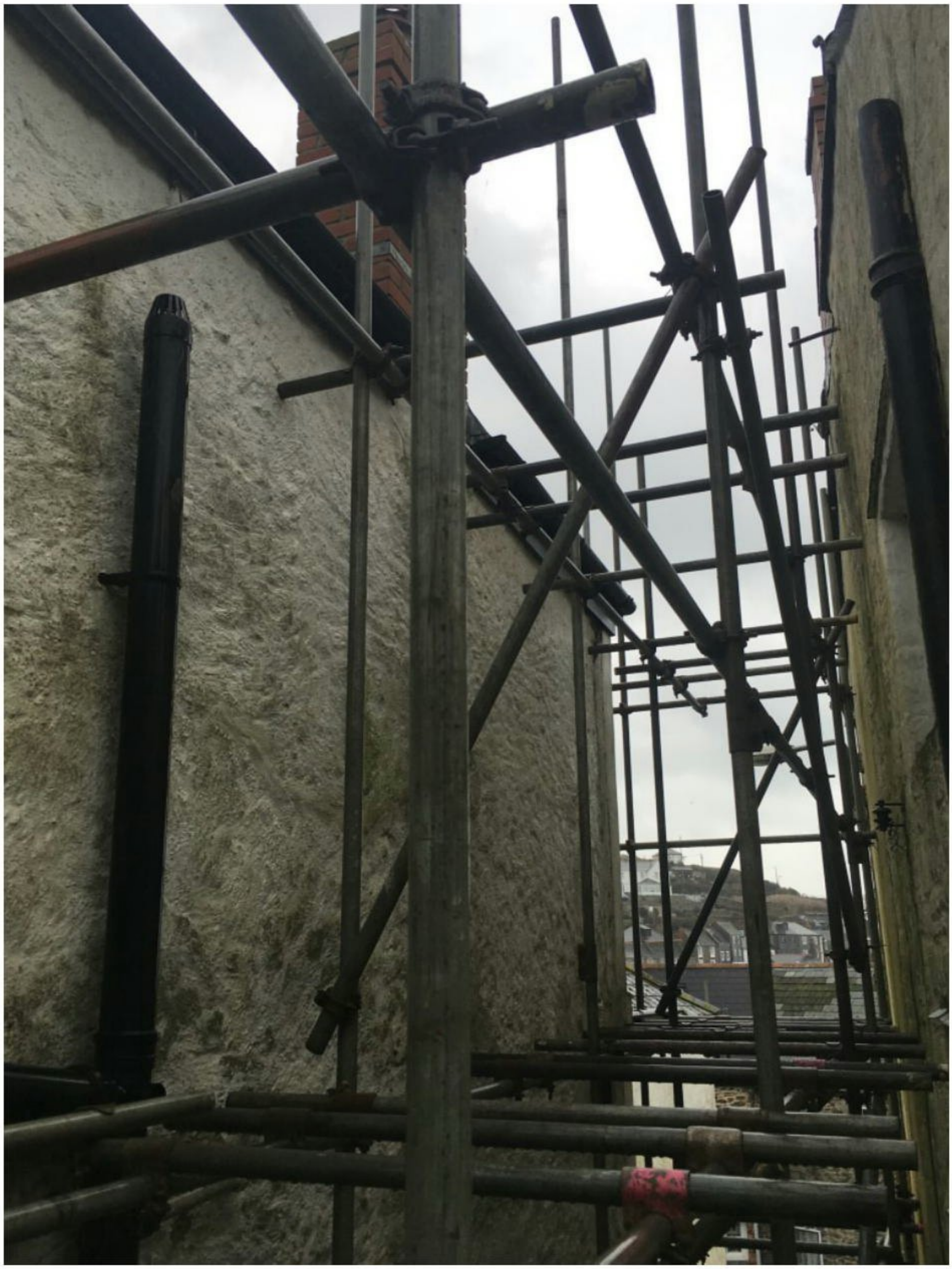
Picture 10 Split purling at the loft space, the roof is lacking vertical support.The rafters will spread outwards. Most of the timbers seem having gained moisture which seems to have halved their strength.







Pictures 11, 12, 13 damaged chimney breast.
The integrity of the walls is degraded beyond repair.

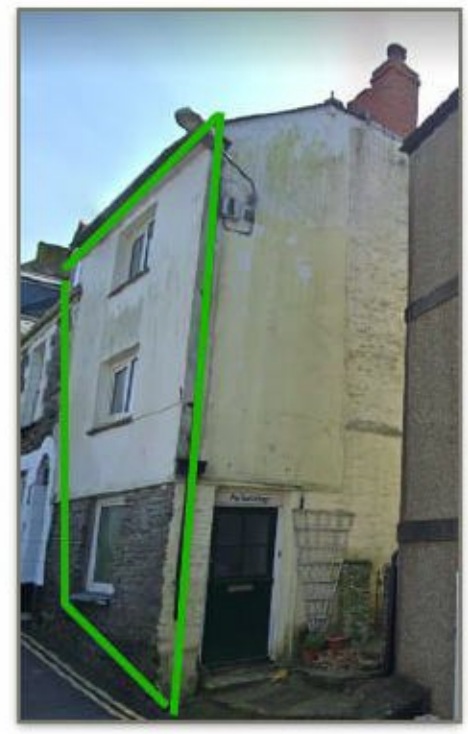


Picture 14 Scaffolding at the side elevation.
Note the chimney stack was only renovated at the top.

3 WALL ELEVATIONS OVERVIEW

Front Elevation:

Ground floor level Shale wall, 500 mm thick with two storeys of block-work built on flat on top. Good Structural condition, tied to the nearby building. ✔

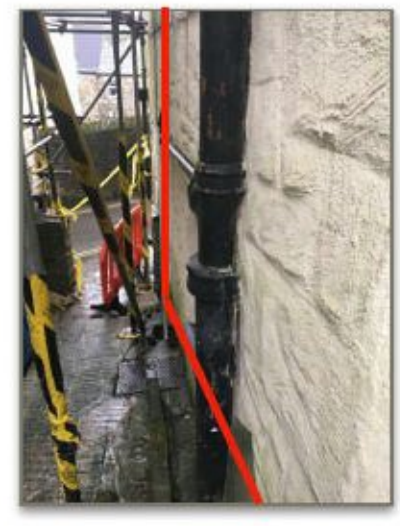


Rear Elevation:

Fully rendered arrow shale wall with bell-cast joint at 2/3rds of its height. Wall leaning outwards towards the street. Roof on top partially sunken. Roof structure is lacking integrity and vertical supports. There is no practical way of supporting a rubble wall once its verticality has been lost, it will eventually come down in a dramatic manner. Given its size any temporary works to restrain the large mass of the wall would increase the wall weight or need their own foundations which would undermine the wall further. ✘

Side Elevation:

Built on partially single skin block-work, only tanked. Connected to a neighbouring property by scaffolding over an alleyway. The scaffolding is not able to transmit the loads from one property to the other effectively, which would be also unsafe. The wall could follow a rear wall collapse in a catastrophic event. ✘



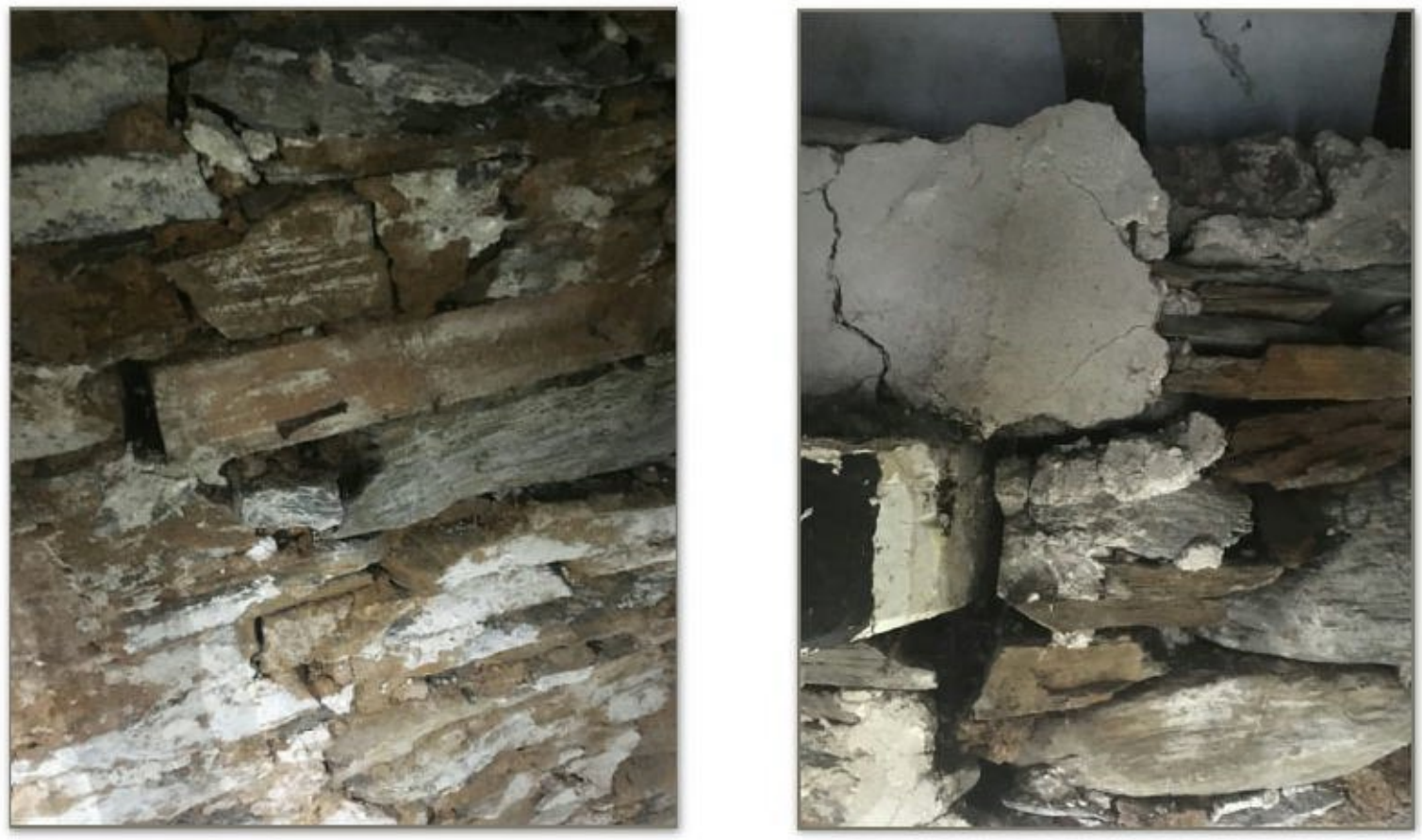
Pictures 15,16 ,17 showing the three elevations

4 STRUCTURAL DESIGN NOTES

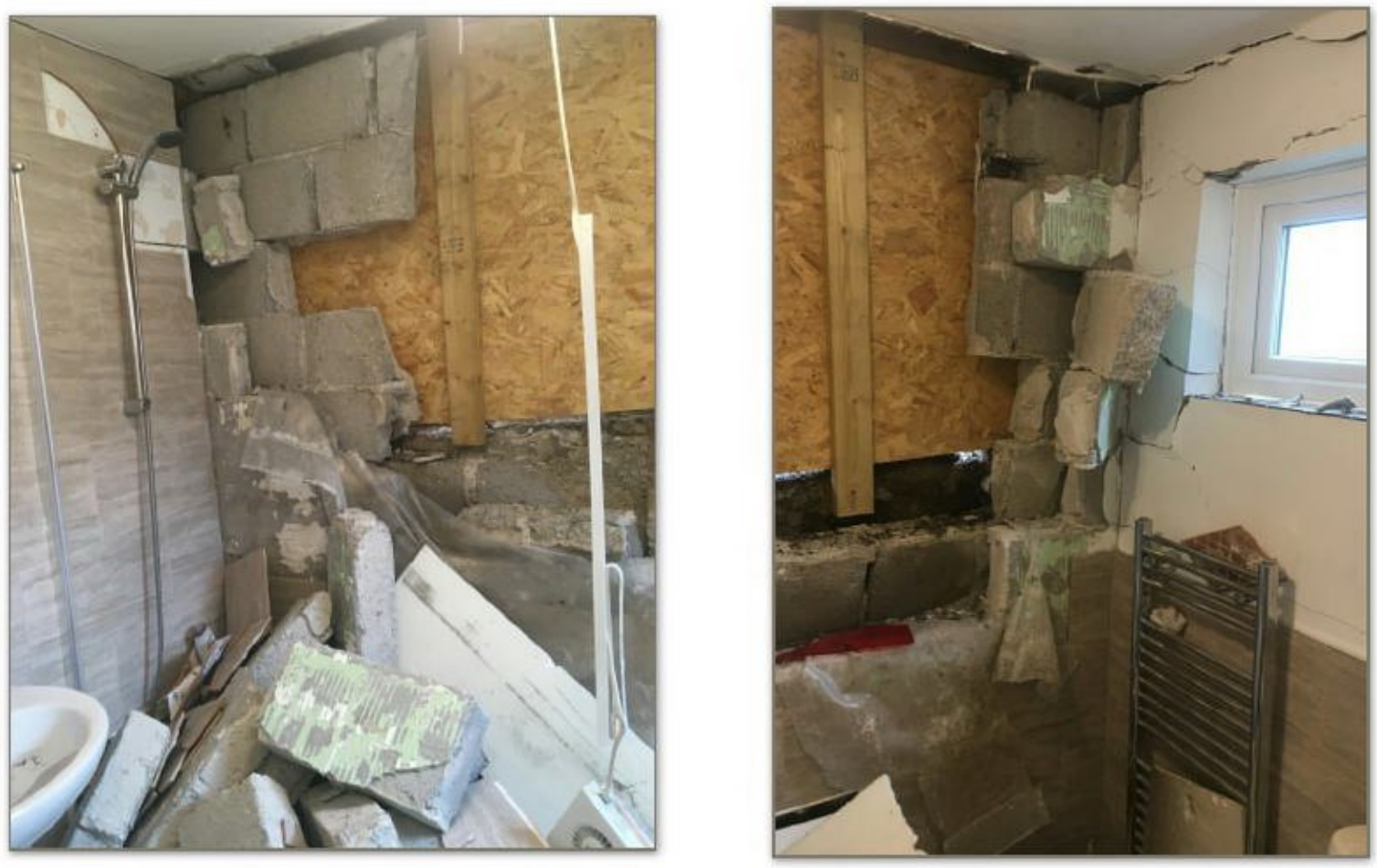
The sidewall's eccentricity on single skin block-work spanning two storeys is over 50; the max limit is 29.

Note the life-span for a wall built with second grade stone is between 50 and 100 years. In this case, the wall contains smaller size stones to the rear and front elevation. Salt degradation would have deteriorated the little mortar left. Mortar quality can reduce or increase the strength of any wall by a half.

The lateral wall has been built on a single skin over 2 storeys.



Pictures 18 -19 Rear wall internal detail. Non homogenous construction, cracks, uneven.



Pictures 20-21 A blockwork wall built without wall ties,
hit by a van suffering an immediate collapse in Truro in February 2021

5 CONCLUSION

The potential for deterioration of buildings during their working lives may surpass the initial reserve of strength against the collapse of the whole or part of the structure. The warning signs are accompanied usually by deformation and by the appearance of additional cracks hours before collapsing.

The rear elevation at No. 15 Polkirt Hill in Mevagissey is leaning outwards; the wall doesn't have the required thickness to be considered stable. Shale rock used to build the walls seems to have been additionally affected by humidity and chemical changes. There is a risk of both the rear and the side walls collapsing while following a progressive pattern. On top of this, the foundations are gushing in rainwater through openings at its base.

There is no practical way of supporting a rubble wall; once its verticality has been lost, it will eventually come down in a dramatic manner. Given its size, any temporary works to restrain the large mass of the wall would increase the wall weight or need their own foundations, which would undermine the wall further.

The side elevation is connected to a neighbouring property via an erected scaffolding. It may transmit loads from a building to another, is not clear if in an effective manner. Its side towards the front elevation is built on single skin blockwork, which fails any attempt to carry out a numerical assessment as its eccentricity doubles the maximum permitted. Additionally, a blockwork wall without ties as there is no cavity is prone to collapse even if hit by a vehicle at low speeds only.

The front elevation, however, was built initially to better standards and has a solid definite aspect. The front elevation of the building could be kept in place. This may benefit access to the site and would require only a reduced level of support from behind.