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STRUCTURES

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Structural Engineer's report on the condition and damage to the
existing garage building due to fire and its suitability for refurbishment

at

North Wing High Chimneys, RG10 0TH

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Summary

From visual inspection, the existing garage building is not in good condition for its age. Despite the poorly damaged buildings due to fire, there are no obvious major signs of structural damage to the existing external walls below the first-floor level which they can be retained as part of the refurbishment work.

Internal floor and roof structures, including door and window lintels, need to be replaced completely.

Repairing works to the existing walls is necessary, and general recommendations have been made in Section 5.

As part of the refurbishment process, our understanding is that the Client plans to carry out internal and external refurbishment works that will improve the overall condition of the building.

The building is suitable for re-use and re-development.

1 Introduction & Description

Qaim Structures was instructed by the client, Mr Jean Pierre Kloppers, to undertake a visual inspection of the damage to the existing property caused by a recent fire incident, assess its condition, and suggest any appropriate remedial works to the noted damage and cracks or further recommendations and advice as necessary.

The existing building is a single-storey detached garage with a converted loft floor. It was built with traditional masonry walls, timber floors, and timber truss roof construction. The use of the existing building was a garage with storage. The ground floor consists of a concrete ground-bearing slab.

According to the geological maps, the underlying soil conditions are London Clay Formation - Clay and silt with a record of Kempton Park Gravel Member - Sand and gravel as superficial deposits.

According to flood maps, the site is in flood zone 1, an area with a low probability of flooding.

The report is for the sole use of the Client and is limited to those areas outlined in the paragraph above. No responsibility is accepted or implied for any third party.

2 Documents examined

The following documents have been reviewed:

- British Geological Survey Maps;
- Environmental Agency, Flood Zone Maps.
- The Institution of Structural Engineers "Appraisal of existing structures (Third Edition 2010)
- CIRIA Report 111 - Structural renovation of traditional buildings
- Building Research Establishment Digests

3 Visual Inspection

3.1 Scope of Inspection

A visual inspection was carried out on 18th October 2024 of the existing building damage due to fire. The weather was dry and clear.

No opening up of works have been carried out as part of this report. We have not carried out any specialist testing on other parts of the property which are covered, unexposed or inaccessible. Therefore, we are unable to report that any such part is free from defect.

No record information currently available provides any data on the original design.

3.2 Visual Observation and Discussion:

The existing building is a single-storey detached garage with a converted loft floor. It was built with traditional masonry cavity walls, timber floors, and timber truss roof construction. The existing building was used as a garage with storage. The ground floor consists of a concrete ground-bearing slab.

All sides of the building is externally clad with bricks. The front area immediately in front of the building consists of brick paving. It was noted that a few existing trees were cut down in the back garden. The trees were approximately 5-10 feet away from the side wall. The tree stumps left remained in the ground. Some vegetation was observed to have overgrown around the rear elevation wall.

The roof has been completely removed and demolished following fire damage except for a few rafters and ridge boards. The building has been badly damaged by fire, including the timber floor and timber lintels above the windows.

It was noticed that there were no vertical movement joints at any of the front, side, or rear elevations. There are no obvious outward signs of bulging walls to the rear, side and front of the property.

Due to fire, timber joists were exposed to intense heat, which caused charring on their surfaces. This charring reduces the effective cross-sectional area of the joist, weakening its load-bearing capacity. As the damage is severe, the joist will no longer be able to support the weight of the floors or partition walls above it.

Timber loses strength as it heats up. While charring acts as an insulating layer to some extent, prolonged exposure to high temperatures has weakened the wood fibres beneath, compromising the joist's overall strength and durability.

Fire-damaged timber joists are more susceptible to moisture absorption, rot, and insect infestation. When the protective outer layer is compromised, the inner parts of the wood become more vulnerable, accelerating further deterioration. Heat causes timber joists to warp, twist, or crack, impacting their alignment and stability. This leads to uneven floor, misalignment of structural components, and potential failure under load. Existing floor joists have been damaged and required to be replaced completely.

Please refer to Appendix A for photos and evidence.

The location and pattern of internal cracking in the property's existing walls suggest that it has occurred due to fire or maybe over a considerable period of time and is not recent.

The lack of movement joints in the outer skin of brickwork on all elevations means that there is no accommodation of thermal expansion of the brickwork. It is unknown and not clear whether there is any presence of external cracking in the existing brick piers due to fire or age. It is likely that the most appropriate form of repairs will be to use helifix crack-repairing techniques on the existing elevations where necessary.

With prolonged exposure, these structural damages accumulate, leading to potential instability. When the supporting beams, brick piers, or connections weaken, they might no longer be able to carry the building's weight, increasing the risk of collapse.

Steel, meanwhile, softens at high temperatures, losing its load-bearing capacity and causing floors or beams to sag. Each material in a building has a different rate of thermal expansion. As they heat up, materials expand, pressing against each other, and if this expansion exceeds the design tolerance, it creates stress within the structure. Steel beams, for example, can expand significantly, causing walls, floors, and joints to distort.

Cleaning steel beams with appropriate solutions, neutralizing acidic residues, and dehumidifying the space can also reduce the rate of ongoing corrosion. Prompt action to clean and treat metal surfaces after smoke exposure can help preserve their integrity and extend their lifespan.

Water used in firefighting can lead to significant secondary damage if not adequately addressed. There could be rainwater ingress into the walls and ponding; when large amounts

of water are used to extinguish a fire, it can pool and soak into floors, walls, and structural elements. Left unchecked, this water seeps into porous materials like wood, drywall, and insulation, making them damp and vulnerable to deterioration. In the aftermath of a fire, addressing water damage is crucial for restoring a safe, healthy environment and protecting the long-term integrity of the structure.

In structural terms, this internal cracking in the existing brick piers falls into Category 1 to 2 of Table 1, Building Research Establishment Digest 251, which describes the damage as “very slight to slight.”

Extract Table 1 BRE Digest 251, Classification of damage based on crack widths

Category	Description	Crack Width
0	negligible	<0.1 mm
1	very slight	0.1 – 1 mm
2	slight	>1 but <5 mm
3	moderates	>5 but <15 mm
4	severe	>15 but <25 mm
5	very severe	>25 mm

The structural defects encountered, requiring urgent attention, immediately threaten the structural integrity of the gable wall above the first floor.

It is evident that the building is not effective and appropriate for this environment. It will also be important to protect the existing building structure from weather and rain to prevent further deterioration.

Further Investigations

An asbestos survey needs to be carried out of the garage building.

An assessment and concentration of contamination are to be carried out due to an existing Oil Tank in the existing extension area to identify the level of contamination present.

Party Wall Agreements should be prepared and submitted to Party Wall Surveyors for all neighbouring properties, allowing adequate time for agreement before any excavation commences.

3 Safety:

The main risks with these kinds of works are usually associated with overall stability, but in this case, there is a risk of localised failure of floor, gable wall, and roof rafters collapse due to the supporting structure being compromised in places due to recent fire. Prior to starting any refurbishment works, adequate temporary works are to be designed by a competent temporary works design engineer for:

- Safeguarding the unstable and compromised areas of roof and floor structure to allow for safe access and execution of works
- Designing a propping scheme allowing for the replacement of structural elements where identified beyond repair while keeping vertical and lateral stability in view following the removal of any stability elements.

Monitoring works will need to be undertaken to ensure compliance with all the planned works in accordance with the overall strategy.

A Principal Designer and a Principal Contractor, under their agreed appointments with the client, are to coordinate all aspects of Health and Safety planning and management under the Construction (Design & Management) Regulations 2015.

Noise and vibration from demolition works are to be minimised by using best practice techniques in accordance with BS 5228: 1994 Noise Control on Construction and Open Sites. Procedures for work are to be in place to ensure that no noisy work takes place outside of usual working hours. Non-percussive and non-vibrating tools and machinery is to be used where practically possible. Any plant, vehicles and equipment should, where possible, be fitted with silencers, acoustic hoods or covers, which should be kept in good order and used at all times.

Extra care is to be taken when loading or unloading vehicles, dismantling scaffolding, etc., to minimise impact noise and vibration and disturbance from persons or vehicles entering or leaving the site. Dust emissions are to be minimised with the use of water spraying and other dust suppression techniques.

4 Conclusions and Recommendations:

The building generally is in poor condition due to fire damage. It is considered that roof and floor and lintels are not serviceable or adequate from a structural viewpoint. It is therefore recommended that the building is internally stripped out to a bare structure. A detailed condition survey is then carried out on individual structural elements to prepare a schedule of repairs, retention, strengthening and replacement.

We would recommend following points needs to be addressed in order to extend the life of the building. Apart from the minor cracking to the existing walls, there is no other major signs of structural damage to the existing walls.

- Existing lintels to the all windows and doors needs to be replaced.
- It is considered that gables above the first floor and the remaining roof rafters and ridge board are dangerous in their current state. And these need to be taken down as soon as possible before carrying out any construction work.
- Existing damaged floor cannot be re-used and needs to be replaced with new floor structures following planning permission.
- Existing floor steel beams must be cleaned, wire brushed, treated, and re-used. No adequate fire protection was observed for the steelwork elements in the form of appropriate fireboarding and/or intumescent paint coatings. All these steel elements must be treated, painted and fire-protected as appropriate.
- We conclude that repairing and strengthening required to the existing external walls to stop further water ingress and damage, mainly repointing, crack stitching and new wall ties, will be required for external walls.
- It is considered that remedial works to the noted cracks are required. Repairing and strengthening works will be carried out to the existing cracks, where necessary, to the existing walls internally using helifix repairing techniques or similar as recommended in section 3.
- Addressing water damage and dampness is crucial for restoring a safe, healthy environment and protecting the long-term integrity of the structure.
- Carry out localised site investigations using trial pits along the external wall to check the existing footing profile and ground conditions.

Other specific and apparently isolated defects exist within the property. These are vertical, diagonal cracking in the brick piers, damp staining on the walls, loose brickwork and mortar, and vertical cracking. As part of the refurbishment process, our standing is that the Client

plans to carry out the full internal and external refurbishment works, which will improve the overall condition of the building.

The external walls supporting the existing floor and the roof structure of the building are generally in reasonable condition for their age and damage due to fire but have been generally poorly maintained, particularly in relation to addressing condensation.

Several essential maintenance issues and repair works have been addressed to extend the life of the building. These are not unusual for a building of this nature. A requirement for other structural and non-structural repairs has also been identified.

Clients should implement a regime of routine maintenance (good housekeeping) to keep the structure in good order. This includes addressing damp-proofing, ensuring good ventilation, removing detritus from and cleaning the surfaces.

The main external walls of the building are suitable for re-use and re-development.



Appendix - A

REF.	PHOTOGRAPH	COMMENT
A.1		View of front elevation from the parking area.
A.2		Side view from the rear corner of the building.



A.3		Side view of gable wall from the front corner.
A.4		View from front with side staircase access to the floor above.



A.5		View of roof rafters and doors from parking area.
A.6		Same as above.



A.7		Rear Elevation of building with broken and damaged window.
A.8		Rear view of building along with vegetation.



A.9		View of damaged front door and lintel is sagging.
A.10		Same as A.8



A.11		Internal View of ground floor ceiling with damaged floor joists due to fire.
A.12		Same as above.



A.13		Same as A.11
A.14		Internal View of damaged front door and lintel.



A.15		Internal View of rear window lintel.
A.16		Same as A.11



A.17		View front brick pier and lintel above door.
A.18		Slight Cracking to the existing brick pier supporting steel beam.



A.19		View of lintel above the door from inside.
A.20		View of timber lintel above window to the rear elevation.



A.21		Same as above.
A.22		View of damaged floor joists along with rusted steel beam and lintels behind.

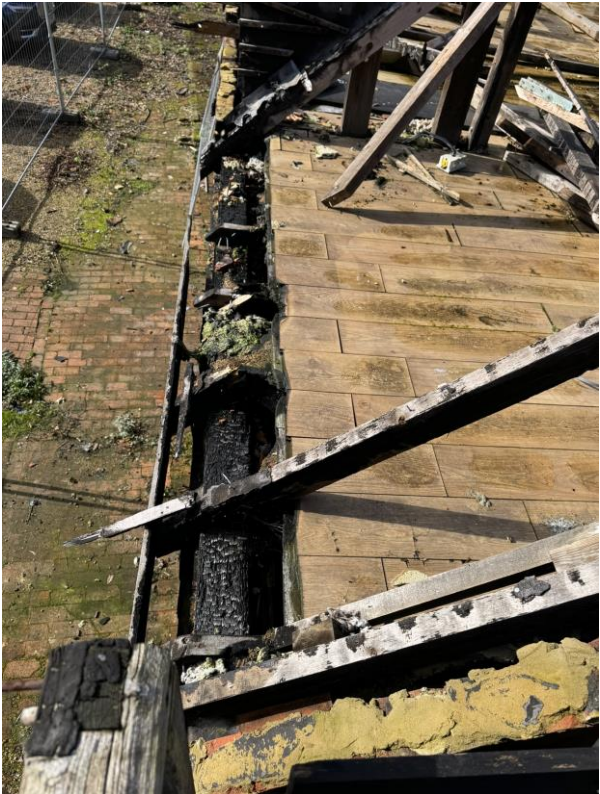


A.23		View of damaged floor joists along with rusted steel beam supporting at existing brick piers.
A.24		Same as above.



A.25		View of wall showing the wall ties between brick and block.
A.26		View of remaining roof rafters and ridge board with laminated timber floor.



A.27		Same as above.
A.28		View of damaged timber plate on existing wall.



A.29		View of remaining roof rafters/ridge board from loft floor.
A.30		View of the gable wall from the roof of the side extension.



A.31



Oil tank in the side single storey extension.