Omega Project Services
Structural - Civil/Stormwater - Construction Management

STRUCTURAL INSPECTION REPORT

FOR RESIDENCE AT

16 GEORGE ST, BELMONT VIC 3216



Overhead view of the property-Google Maps

Dated:	05/11/2025
Ref Number:	20251105-404
Client Name:	Donna Cartwright
Date of Inspection:	22/10/2025

A. INTRODUCTION

Omega Project Services, being Consulting Structural Engineers and Chartered Member of the Institute of Engineers Australia, visited and inspected the property at 16 George St, Belmont VIC 3216.

This structural inspection was conducted at the client's request to evaluate the current integrity of the residential dwelling and assess its stability and structural integrity. The report provides professional advice on the necessary requirements for subsequent renovation and remediation works.

B. SCOPE OF WORK

- Visual inspection of residential structure to know present condition of various structural elements and dwelling as a whole.
- To identify the area and elements under structural distress and their likely causes.
- To know the residual strength and quality of structural members.
- To provide Structural condition report based on visual inspection.

Note: All observations and conclusions are based on visual inspection and professional engineering judgment.

C. STRUCTURAL OBSERVATIONS AND DEFECTS

Ceiling and Cornice Distress:

- Consistent Cracking: Widespread, consistent cracking is present in the cornices across the dwelling, frequently occurring at the intersection of the cornice and the wall/ceiling surfaces.
- Separation Gaps: Clear separation gaps are evident between the ceiling membrane and the perimeter walls/cornices, confirming differential vertical movement between the ceiling structure and the main wall structure.
- Ceiling Cracks: Fine to moderate cracking is noted within the main ceiling surfaces.

Wall and Opening Distress:

- Diagonal Cracking: Consistent diagonal cracks are observed emanating from the corners of internal and external wall openings (e.g., windows and doors), which is characteristic of shear stress caused by foundation movement.

Significant Stepped Cracking: Prominent stepped cracks are visible in the external brickwork. These major cracks are concentrated in key areas:

- Near the main staircase/entrance area.
- Towards the left elevation of the dwelling.
- *Interpretation: These cracks indicate major differential vertical settlement or heave localized to these zones.*

Foundation Condition:

- Where limited sections of the foundation were exposed, the mortar in the footings was observed to be significantly loose and deteriorated, reducing the effective load-bearing capacity of the existing foundation structure.

Uplifted and Damaged Wall Section:

- A specific section of the wall structure was observed to be uplifted and damaged, correlating with a potential localized heave or lateral pressure issue.

Property Wall Integrity: There are significant damage and displacement observed in the property boundary wall (as detailed in the accompanying image/description), resulting in an immediate risk of collapse and necessitating urgent remediation.

Note: Foundation inspection was limited due to restricted access and narrow working space.



Fig 1: Internal Distress at Wall-Ceiling Junctions



Fig 2: Cornice Cracks



Fig 3: Shear Stress Cracking Above Openings



Fig 4: Ceiling and Cornice Cracks



Fig 5: Widespread and Significant Stepped Cracks







Fig 6: Lateral Displacement and Failure of Boundary Retaining Wall

D. UNDERSTANDING CRACKING AND STRUCTURAL BEHAVIOUR

Diagonal Cracking at Openings (Stress Risers)

Diagonal cracks originating from the corners of openings, such as door and window apertures, are a classic manifestation of stress concentration and shear failure within a load-bearing wall system. These cracks typically propagate at an angle of approximately 45 degrees from the horizontal, following the lines of principal tensile stress.

Mechanics of Formation

The perimeter of an opening acts as a discontinuity, fundamentally disrupting the uniform distribution of forces (both compressive and tensile) within the wall panel. The corners serve as stress risers where the force lines converge, leading to localized stress amplification.

1. Shear Failure: Under excessive vertical load, or more commonly, differential movement (settlement or uplift), the wall panel attempts to deform. This deformation places the wall material (e.g., masonry, concrete, or plaster over light-

frame construction) under a state of diagonal tension and shear stress. When the principal tensile stress exceeds the material's low inherent tensile strength, the characteristic 45-degree crack forms.

Analysis of Diagonal Cracking (Width < 1mm)

The observation that all internal wall cracks, including the diagonal cracks at the corners of openings, measure under significantly downgrades the immediate structural concern.

Likely Causes: Cracks in this minimal range are typically attributed to non-structural or minor, stabilized movements:

- Drying Shrinkage: Initial, irreversible volume reduction in mortar, plaster, or drywall compound. This is highly common in newly finished construction.
- Thermal/Moisture Movement: Minor, cyclic expansion and contraction of materials due to seasonal temperature and humidity changes.
- Elastic Deflection: Small, acceptable movement of the supporting structure (e.g., the lintel or timber frame) under service loads that the brittle finish cannot accommodate.

Table 1: Defect category

Crack width range	Category	Structural implication
<1mm	Fine cracks (Category 1)	Generally cosmetic, minimal structural effect.
<5mm	Cracks easily filled (Category 2)	Serviceability issues (e.g., sticking doors/windows, impaired weather-tightness). Structural

		stability is not immediately threatened.
5mm-15mm	Cracks requiring opening up (Category 3)	Damage may require replacement of masonry/wall sections; service pipe fracture risk.

1. Analysis of Cracking at Wall-Ceiling Junction

Cracks running along the line where the wall meets the ceiling are almost always related to movement in the roof.

Potential Causes:

Truss Uplift -

Effect: The differential movement causes the truss to arch upward, lifting the center of the ceiling away from the top of the non-load-bearing interior walls. This creates a hairline to small horizontal crack along the ceiling-wall joint.

2. Analysis of Cracks Originating from Openings

Diagonal (45-degree) or vertical cracks radiating from the corners of window or door openings are classic signs of Differential Settlement.

Differential Settlement: The foundation moves unevenly, twisting the wall section and concentrating stress at the weakest points (the opening corners).

The combination of a prominent horizontal wall crack and ceiling-wall junction cracking suggests an underlying issue involving load distribution and/or structural deflection.

3. Analysis of Stepped Cracks in Brickwork:

Stepped cracks are those that run diagonally up or down a masonry wall, following the lines of the mortar joints. They are considered a strong indicator of differential movement within the structure.

Primary Indication: Foundation Settlement or Movement

The most common and most serious cause of stepped cracks is differential foundation settlement.

- Mechanism: This occurs when one section of the building's foundation settles (sinks) more or faster than the adjacent section. This uneven sinking causes the rigid wall above to shear (slide or tear) at the point of least resistance, which is always the mortar joint.

Effect: The movement forces the wall to crack in a diagonal, step-like pattern as it tries to accommodate the change in support level.

Common Causes of Foundation Settlement:

- Expansive Clay Soils: Soils that expand when wet and shrink when dry (common in clay-heavy areas) can cause the foundation to heave and settle unevenly with seasonal moisture changes.
- Poor Drainage/Water Infiltration: Water pooling near the foundation (due to blocked gutters, downpipes discharging too close to the house, or poor grading) can wash away soil (erosion) or saturate the soil, causing localized settlement.

Observed Distress: Cornice Cracks

The distress observed within the structure includes consistent cracking along the cornices, particularly at the junctions between internal walls and ceilings. This is a very common indicator of structural movement.

Significance: The cornice bridges two separate structural elements (the wall frame and the roof/ceiling frame), cracking here is a primary visual symptom of differential movement between these elements.

E. RECCOMENDATION

Step 1: Structural Stabilization via Deep Foundation System (Helical Piering/Underpinning)

The priority is to bypass the unstable shallow soil and secure the structure to a stable stratum. Since the footing details are obscured, a deep foundation system that connects directly to the wall load is the most robust and verifiable solution.

- Implement a deep foundation system, such as Helical Piers (Screw Piles), at specified points beneath the load-bearing walls experiencing differential settlement.

Note: Helical piers are preferred due to their ability to be installed with minimal excavation, verified load capacity (via torque monitoring), and reduced surface area exposed to future expansive soil heave.

Step 2: A geotechnical investigation is required immediately to determine the depth of the stable, load-bearing soil (stratum).

Step 3: Loose Mortar Joints Remediation (Repointing)

- All loose, deteriorated, or powdery mortar should be raked out from the joints to a depth of at least 15mm-20mm until a sound, clean surface is reached.

Step 4: Property wall remediation

Immediately establish a safety barrier to prevent pedestrian contact with the displaced or unstable section of the wall, particularly at the corner where bricks are missing/loose.

- The entire severely damaged and displaced section of the brickwork and its underlying foundation must be carefully demolished and removed.
- Construction of New Wall: A new retaining wall must be constructed to the appropriate structural standard.
- New brick or concrete masonry unit (CMU) construction, incorporating steel reinforcement (rebar) that is anchored into a new, stable concrete footing.

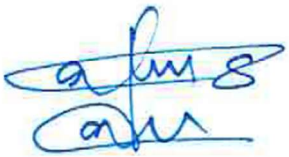
The new wall must incorporate essential elements to prevent future failure:

- Stable Footing: A new concrete footing capable of resisting the overturning pressure of the soil.
- Drainage: Installation of weep holes at the base and a clear gravel drainage layer wrapped in geotextile fabric behind the wall to prevent hydrostatic pressure buildup.

Thank you for engaging our services in this instance and I trust the above report has addressed all your concerns. Should you need anything further, or require any matters to be elaborated on, please contact the undersigned. This report is based on the site visit conducted on 22/10/2025.

Yours faithfully,

For Omega Project Services



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