**Observation**

Inspection was undertaken at the subject property in the presence of the Insured to which the following damage was noted:

## Entry

1. We noted cracking along the cornice and wall lining junction corresponding to the top corner of the entry door and the entry hallway. **Images 2 - 6**
2. We noted cracking to the wall linings propagating along the junction of intersecting walls within the entry hallway. **Image 7**
3. From our inspection and our structural assessment, in our opinion, the above-noted damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.

## Ground Front Bedroom – Northeast Alignment

1. We noted cracking and a gap between the cornice and wardrobe corresponding to the front bedroom about the northeast alignment of the subject building. **Image 8**
2. From our inspection and our structural assessment, in our opinion, the above-noted damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.

## Ground Front Bedroom – Northwest Alignment

### Cracking Along Cornice and Wall Lining Junction

1. We noted cracking and a gap between the cornice and wall lining corresponding to the front bedroom about the northwest alignment of the subject building. **Images 9 & 10**
2. From our inspection and our structural assessment, in our opinion, the above-noted damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.

### Deflection and Undulation of Ceiling Lining

1. Moreover, we noted evidence of deflection and undulation to the ceiling lining within the subject bedroom. **Image 11**
2. The observed deflection within the ceiling lining, in our opinion, is consistent with the relaxation of the fixings/adhesive and detachment from the supportive ceiling framework.
3. In our opinion, the bond and grip between the fixings/ adhesive of the ceiling lining into the supportive ceiling framework has been compromised over an extended period of time due to general wear and tear, which has ultimately resulted in the exhibited sagging and deflection.

## Kitchen/Dining

### Cracking to Wall Linings

1. Moreover, we sighted vertical cracking propagating from the top corner of the door opening between the entry hallway and kitchen/ dining area. **Images 12 & 13**
2. In our opinion, the pattern and mechanism of exhibited damage are consistent with the following factors:
   1. Inherent differential thermal movement (the expansion and contraction within the internal fabrics, which can arise from changes in environmental temperatures) between the wall lining and the underlying timber framework, inducing cracking about the points of high-stress concentrations (in particular, corner of openings, changes in direction, intersection of distinct materials and wall corner junction of perpendicular intersecting walls and etc).
   2. Defective installation of plasterboard sheeting about the door opening in accordance with *Australian Standard* *AS 2589:2017 - Gypsum linings - Application and finishing*.
3. *Australian Standard* *AS 2589*, states:

*“To avoid cracking of vertical joints at openings such as windows and doorways, vertical joints shall not coincide with the edge of openings and the sheets shall be laid so that the vertical joints fall a minimum of 200 mm from the edge of the opening”*

1. In particular, the plasterboard sheet joints are to be at 200mm minimum from the edge of the opening as shown in **Appendix A,** a schematic diagram extracted from the USG Boral Plasterboard Installation Manual in line with the aforesaid Australian Standard requirements.
2. As such, in our opinion, the noted cracking is cosmetic damage as a result of inherent building defect relative to the defective installation of plasterboard wall lining, which can result in cracking to propagate about the high-stress points due to inherent movement caused by differential thermal expansion/ contraction within the wall lining and the underlying framework.
3. Similar to the above, we noted vertical cracking to the wall lining immediately adjacent to the aforesaid door opening, which is also consistent with superficial damage due to the inherent differential thermal movement. **Image 14**
4. Further to the above, we noted cracking along the cornice and cracking along the wall lining above the kitchen cabinets adjacent to the existing timber beam supporting the upper flooring. **Image 15**

1. In our opinion, such damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.

### Protruding Nail Fixings Within Ceiling Lining

1. Furthermore, we noted evidence of protruding nail fixings within the ceiling lining corresponding to the kitchen/ dining area. **Image 16**
2. In our opinion, the observed damage is consistent with the long-term relaxation of fixings and detachment from the supportive ceiling framework.

## Stair Landing

### Cracking to Walls and Ceiling Linings

1. We noted vertical cracking propagating from the top corner of the door opening between the bedroom and the stair landing area. **Images 17 & 18**
2. As previously mentioned, the pattern and mechanism of damage are consistent with cosmetic damage due to the following factors:
   1. Inherent differential thermal movement (the expansion and contraction within the internal fabrics, which can arise from changes in environmental temperatures) between the wall lining and the underlying timber framework, inducing cracking about the points of high-stress concentrations (in particular, corner of openings, changes in direction, intersection of distinct materials and wall corner junction of perpendicular intersecting walls and etc).
   2. Defective installation of plasterboard sheeting about the door opening in accordance with *Australian Standard* *AS 2589:2017 - Gypsum linings - Application and finishing*.
3. Subsequently, in our opinion, the noted cracking is cosmetic damage as a result of inherent building defect relative to the defective installation of plasterboard wall lining, which can result in cracking to propagate about the high-stress points due to inherent movement caused by differential thermal expansion/ contraction within the wall lining and the underlying framework.
4. Moreover, we noted cracking to the cornice mitre joint and vertical cracking to the intersection of wall linings local to the corner of the stair landing area. **Images 19 & 20**
5. In our opinion, such damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.
6. Furthermore, we noted cracking to the ceiling/ wall linings local to the corners of the void above the stairs. **Images 21 - 23**
7. In our opinion, such damage is consistent with inherent building movement and/ or differential thermal movement within the lining and the supporting framework, resulting in the observed cracking about the high-stress concentration point.
8. We reiterate that the high-stress points are generally developed where there is a change in direction (corners, wall to ceiling junction, etc.) due to movement within the substrate/underlying structure or temperature and humidity fluctuation in the lining.
9. We also noted evidence of the previous patching and repairing works to the above-noted cracks, which is an indication of the ongoing issue.

### Protruding Nail Fixings Within the Plasterboard Wall Lining

1. In addition, we noted protruding nail fixings within the plasterboard wall lining corresponding to the stair landing area. **Images 24 & 25**
2. Such damage is superficial and consistent with the relaxation of nail fixing from the supporting timber studs due to the poor installation of nails at the time of construction, which over time, can result in nail fixings becoming loose and breaking through the plasterboard sheets over time.

## Ground Floor Side Bedroom

### Cracking to Plasterboard Wall Lining

1. From our inspection, we noted cracking propagating along the intersection of wall linings local to the corner of the bedroom. **Images 26 & 27**
2. In addition, we noted horizontal cracking to the wall lining adjacent to the window opening. **Image 28**
3. In our opinion, such damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.

### Protruding Nail Fixings Within the Plasterboard Wall Lining

1. In addition, we noted protruding nail fixings about the base of the wall lining below the bedroom window. **Image 29**
2. Such damage is superficial and consistent with the relaxation of nail fixing from the supporting timber studs due to the poor installation of nails at the time of construction, which over time, can result in nail fixings becoming loose and breaking through the plasterboard sheets over time.

## Living Room

1. We noted cracking along the plasterboard wall lining and the exiting timber architrave adjacent to the stairs. **Images 30 & 31**
2. In our opinion, such damage is consistent with inherent building movement and/ or differential thermal movement within the lining and the supporting framework, resulting in the observed cracking about the high-stress concentration point.

## Upper Floor Bedroom

### Cracking Within Plasterboard Wall Lining

1. We noted diagonal cracking propagating from the bottom corner of the window opening within the upper floor bedroom. **Images 32 & 33**
2. In our opinion, the noted cracking is consistent with inherent thermal movement inducing cracking about the high-stress concentration points (window opening).

### Protruding Nail Fixing Within Ceiling Lining

1. We further noted evidence of protruding nail fixings within the ceiling lining. **Image 34**
2. In our opinion, the observed damage is consistent with the long-term relaxation of fixings and detachment from the supportive ceiling framework.

**Discussion**

## Assessment of Internal Cracking and Foundation Reactivity

### Assessment of Footing Movement and Foundation Reactivity

1. In prefacing the assessment of the experienced footing movement, we refer to *Australian Standard* *AS 2870 – Residential Slabs and Footings* which acknowledges that foundation movement and reactivity naturally occurs on nearly all sites and that it is impracticable to design a footing system that will protect the building from movement under all circumstances.
2. We also refer to the *CSIRO publication, BTF 18 – Foundation Maintenance and Footing Performance: A Homeowner’s Guide*, which clearly indicates that buildings can and often do move because of one or more issues in the foundation soil, namely relating to differential settlement, erosion, saturation, seasonal wetting and drying. **Appendix B**.
3. In saying this, general foundation movement occurs as a result of gradual settlement of supporting soils following construction as well as changes in moisture content within the foundation material, which shrinks upon drying and swells upon wetting over multiple courses of rainfall, causing heaving and shifting within the footings gradually and progressively over an extended period of time.
4. On this basis, on-going differential settlement, cyclic foundation reactivity and ground movement is expected to occur at all sites to some extent, to which building movement and cracking is ultimately expected over time.
5. Further to the above, upon inspection of the subfloor area, we advise that the existing footing system is consisted of isolated brick piers constructed off brick footings. **Images 35 & 36**
6. In saying this, brick footing system is highly susceptible to movement compared to concrete footing system due to non-homogenic movement within the individual bricks.

### Assessment of External Drainage

1. We estimate that the construction of the subject property is predating the inception of *National Construction Code* - *NCC* BCA 2019.
2. Notwithstanding the above, we reference the NCC BCA and current Australian Standards to clarify and explain the mechanism of damage.
3. With regards to external drainage, *Australian Standard* AS2870 states that “*surface drainage shall be designed and constructed to avoid water ponding against or near the footing”.* **Appendix C**.
4. From our inspection, we noted that the existing external drainage provision to be inadequate to effectively intercept water away from the subject building and footing system.
5. From our inspection, we noted that the natural topography of the land is sloping towards the subject house and subfloor space.
6. In saying that, the subfloor is susceptible to a large volume of surface and subterranean water during periods of rainfall.
7. **We advise that such inherent construction and inadequate external drainage system facilitates the migration of water into the subfloor area during general storms and rainfalls.**

### Assessment of Subfloor Drainage

1. From the review of the subfloor drainage, we noted the existing drainage provisions are inadequate to divert water away from the subfloor area.
2. In accordance with NCC BCA 2019, the ground beneath suspended floors must be graded so that the area beneath the building is above the adjacent external finished ground level and surface water is prevented from ponding under the building.
3. Moreover, we noted evidence of building debris within the subfloor, which in our opinion, inhibit free drainage of entrapped water within the subfloor area.
4. We refer to NCC BCA 2019, which outlines the following with respect to subfloor drainage. **Appendix C**:
   1. *Drainage system must be installed under buildings and where site conditions exist that create a need for subsoil water to be diverted away from footings, basements, retaining walls etc.*
5. **From our review of the subfloor construction, we noted insufficient drainage provision to ensure that the entrapped water is adequately diverted away from the subfloor area.**

### Assessment of the Additional Rainfall

1. We acknowledge that the record high rainfalls occasioning the area is consistent with the ***La Niña*** rainfall phenomena, in particular since 2020 till this current time in 2022.
2. Based on the above, the significant increase in rainfall within the past two (2) years and into 2022 has caused higher degree of fluctuation in foundation material moisture content, which resulted in more severe foundation reactivity and movement resulting in more prominent movement and damage within the building fabrics.
3. In our opinion, we consider the increase in received rainfall from 2020 to current to be the dominant factor in contributing to building movement as claimed rather than any defined event.
4. In addition, we were unable to identify any sign of damage or movement to the internal building fabrics, consistent with damage due to the sudden and abrupt movement within the foundation and the footing system.
5. Moreover, from our inspection of the subfloor, no sign of short-term damage or subsidence to the supporting brick piers and walls was noted to indicate the integrity of the footing system and the supporting soil have been compromised due to the experienced storm event.
6. In our opinion, the observed damage is consistent with general building movement due to inherent foundation reactivity, which results in cracking within the internal linings about the points of high-stress concentrations (corners, change in direction, door and window openings etc).
7. Considering the above, in our opinion, insufficient external and subfloor drainage has allowed water to permeate into the subfloor area, particularly during the recent ***La Niña*** period, and causing ongoing foundation reactivity which resulted in general building movement.

To this end, in our opinion, **the underlying cause of the observed cracking within the subject property is a result of inherent construction issues due to the lack of drainage provisions in combination with long-term foundation reactivity and movement, unrelated to a one-off event**.

**Conclusion**

## Observed Damage

We have provided **Table 1** below to outline the observed damage to each area within the subject building.

| **Area** | **Observed Damage** | **Proximate Cause of Damage** |
| --- | --- | --- |
| **Entry** | Cracking along the cornice and wall lining junction corresponding to the top corner of the entry door and the entry hallway | From our inspection and our structural assessment, in our opinion, the above-noted damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.  **In our opinion, the noted damage is pre-existing in origin and unrelated to any single storm event.** |
| **GF Bedroom –Northeast Alignment** | Cracking and a gap between the cornice and wardrobe corresponding to the front bedroom about the northeast alignment of the subject building | From our inspection and our structural assessment, in our opinion, the above-noted damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.  **In our opinion, the noted damage is pre-existing in origin and unrelated to any single storm event.** |
| **GF Bedroom –Northwest Alignment** | Cracking and a gap between the cornice and wall lining corresponding to the front bedroom about the northwest alignment of the subject building | From our inspection and our structural assessment, in our opinion, the above-noted damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.  **In our opinion, the noted damage is pre-existing in origin and unrelated to any single storm event.** |
| **GF Bedroom –Northwest Alignment** | Deflection and undulation to the ceiling lining within the subject bedroom | The observed deflection within the ceiling lining, in our opinion, is consistent with the long-term relaxation of the fixings/adhesive and detachment from the supportive ceiling framework, resulting in the exhibited sagging and deflection.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Kitchen/ Dining** | Vertical cracking propagating from the top corner of the door opening between the entry hallway and kitchen/ dining area | In our opinion, the pattern and mechanism of exhibited damage are consistent with the following factors:   * Inherent differential thermal movement (the expansion and contraction within the internal fabrics, which can arise from changes in environmental temperatures) between the wall lining and the underlying timber framework, inducing cracking about the points of high-stress concentrations (in particular, corner of openings, changes in direction, intersection of distinct materials and wall corner junction of perpendicular intersecting walls and etc). * Defective installation of plasterboard sheeting about the door opening in accordance with *Australian Standard AS 2589:2017 - Gypsum linings - Application and finishing*.   **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Kitchen/ Dining** | Vertical cracking to the wall lining immediately adjacent to the aforesaid door opening. | In our opinion, the noted damage is cosmetic and consistent with cracking due to the inherent differential thermal movement between lining and the underlying framework.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Kitchen/ Dining** | Cracking along the cornice and cracking along the wall lining above the kitchen cabinets adjacent to the existing timber beam supporting the upper flooring | In our opinion, such damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.  **In our opinion, the noted damage is pre-existing in origin and unrelated to any single storm event.** |
| **Kitchen/ Dining** | Evidence of protruding nail fixings within the ceiling lining corresponding to the kitchen/ dining area | In our opinion, the observed damage is consistent with the long-term relaxation of fixings and detachment from the supportive ceiling framework.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Stair Landing** | Vertical cracking propagating from the top corner of the door opening between the bedroom and the stair landing area | In our opinion, the pattern and mechanism of exhibited damage are consistent with the following factors:   * Inherent differential thermal movement (the expansion and contraction within the internal fabrics, which can arise from changes in environmental temperatures) between the wall lining and the underlying timber framework, inducing cracking about the points of high-stress concentrations (in particular, corner of openings, changes in direction, intersection of distinct materials and wall corner junction of perpendicular intersecting walls and etc). * Defective installation of plasterboard sheeting about the door opening in accordance with *Australian Standard AS 2589:2017 - Gypsum linings - Application and finishing*.   **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Stair Landing** | Cracking to the cornice mitre joint and vertical cracking to the intersection of wall linings local to the corner of the stair landing area. | In our opinion, such damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Stair Landing** | Cracking to the ceiling/ wall linings local to the corners of the void above the stairs. | In our opinion, such damage is consistent with inherent building movement and/or differential thermal movement within the lining and the supporting framework, resulting in the observed cracking about the high-stress concentration point.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Stair Landing** | Sings of protruding nail fixings within the plasterboard wall lining corresponding to the stair landing area. | In our opinion, Such damage is superficial and consistent with the relaxation of nail fixing from the supporting timber studs due to the poor installation of nails at the time of construction, which can result in nail fixings becoming loose and breaking through the plasterboard sheets over time.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Ground Floor Side Bedroom** | Cracking propagating along the intersection of wall linings local to the corner of the bedroom.  In addition, we noted horizontal cracking to the wall lining adjacent to the window opening | In our opinion, such damage is cosmetic and consistent with inherent and general building movement and ongoing foundation reactivity.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Ground Floor Side Bedroom** | Signs of protruding nail fixings about the base of the wall lining below the bedroom window. | In our opinion, such damage is superficial and consistent with the relaxation of nail fixing from the supporting timber studs due to the poor installation of nails at the time of construction, which over time, can result in nail fixings becoming loose and breaking through the plasterboard sheets over time.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Living Room** | Cracking along the plasterboard wall lining and the exiting timber architrave adjacent to the stairs | In our opinion, such damage is consistent with inherent building movement and/or differential thermal movement within the lining and the supporting framework, resulting in the observed cracking about the high-stress concentration point.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |
| **Upper Floor Bedroom** | Cracking propagating from the bottom corner of the window opening within the upper floor bedroom | In our opinion, the noted cracking is consistent with inherent thermal movement inducing cracking about the high-stress concentration points (window opening). |
| **Upper Floor Bedroom** | Evidence of protruding nail fixings within the ceiling lining. | In our opinion, the observed damage is consistent with the long-term relaxation of fixings and detachment from the supportive ceiling framework.  **In our opinion, the noted damage is pre-existing in origin and unrelated to the claimed storm event or any other one-off storm event.** |

## Assessment of Internal Cracking and Foundation Reactivity

Further to the above, as outlined in the body of this Report, in accordance with *Australian Standard AS 2870* and CSIRO publication, foundation reactivity occurs on nearly all sites due to seasonal moisture fluctuation within the foundation soils and is almost impractical to design a footing system to prevent the building from undergoing movement.

In addition to the above, given that Australia is going through the ***La Niña*** period, the increase in the received rainfalls within the past two (2) years and into 2022 further facilitates foundation reactivity within the subfloor area.

In addition, we advise there is a lack of drainage provisions to intercept stormwater from entering the subfloor or divert the entrapped water away from the subfloor area.

Considering the lack of drainage provisions, we consider the increase in received rainfall from 2020 to current to be the dominant factor in contributing to building movement as claimed rather than a defined event.

**Considering the foregoing, in our opinion, the underlying cause of the observed internal cracking is a result of inherent construction issues due to lack of external and subfloor drainage which enables water to permeate into the subfloor and cause ongoing and long-term foundation reactivity, unrelated to a one-off event.**

**To this end, in our opinion, the observed damage is superficial in nature, which can be pathed and repaired, and the overall structural integrity of the subject dwelling has not been compromised.**