REPORT 23688 F1, 10 September 2021

BUILDING CONDITION REPORT

AT:	**DEANS MARSH COMMUNITY HALL 20 PENNYROYAL VALLEY ROAD, DEANS MARSH**
PREPARED FOR:	[redacted] **Surf Coast Shire**
REPORT NO.:	**23688 F1 REV 1**
REPORT DATE.:	**10 September 2021**

P.J. YTTRUP & ASSOCIATES PTY LTD | CONSULTING ENGINEERS

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

Site Details:

DEANS MARSH COMMUNITY HALL,
20 PENNYROYAL VALLEY ROAD,
DEANS MARSH

REPORT NAME.: 23688 F1 BUILDING CONDITION REPORT

Client Details:

SURF COAST SHIRE
Attention: [redacted]

Document Control:

Issue	Date	Prepared By	Issued To
Rev 1	10/09/2021	B. Kirwan	[redacted]

Disclaimer:

Recommendations and opinions contained in this report are based on a limited investigation, including the interpretation of conditions observed on site, and from the engineering knowledge and experience of the professional engineer undertaking the inspection.

The nature and condition of materials on site can be inferred, but it must be appreciated that actual conditions could vary from the assumed conditions. Actual conditions may differ, because no professional, no matter how qualified, can reveal what is hidden without detailed inspections and analysis. Recommendations are provided in the report for further investigation. If conditions other than those described are encountered, this office should be engaged to assess whether recommendations should be revised. We cannot accept responsibility for problems that may occur due to changed factors if not consulted.

This report shall be reproduced in full. The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Recommendations are provided in the report to take action to improve safety. This office accepts no liability of inaction by responsible persons if measures to improve safety are delayed or not undertaken.

Contact Details:

Brian Kirwan
Senior Structural/Civil Engineer
B.Eng.(CIVIL)(HON)

P.J. YTTRUP & ASSOCIATES PTY. LTD.
33 Roberts Road, Belmont, 3216
T: 03 5243 3388   F: 03 5244 3023
admin@yttrup.com

CONTENTS

P.J. YTTRUP & ASSOCIATES PTY LTD | CONSULTING ENGINEERS

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

APPENDIX A – **Previous Reports & Background – Client Supplied**

APPENDIX B – **Yttrup Investigation Drawings**

APPENDIX C – **Site Photographs**

APPENDIX D – **General Notes 1 to 3;**
CSIRO Sheet 10-91 – "Guide to home owners on foundation maintenance and footing performance"

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com
A.C.N. 005 909 919
A.B.N. 71 687 799 203

BUILDING(S) CONDITION REPORT AT

DEANS MARSH COMMUNITY HALL 20 PENNYROYAL VALLEY ROAD, DEANS MARSH

REFERENCE NO. 23688 F1

1.0 INTRODUCTION

P.J. Yttrup and Associates (Yttrup) were engaged by [redacted] (Surf Coast Shire) to prepare a building condition report on structural performance and condition of the buildings at Deans Marsh Community Hall, 20 Pennyroyal Valley Hall, Deans Marsh.

An inspection was carried out by Brian Kirwan and Ambrose McIntyre, Structural/Civil Engineers, on 23 June 2021.

This report has been prepared by Brian Kirwan and reviewed by Nathan McLaren, Director.

2.0 SCOPE OF ASSESSMENT AND REPORT

The observations, discussions and recommendations made in this report are based on the following level of review:

- Desktop review of relevant site and building information provided by Client, including structural engineering heritage assessment brief (Surf Coast Shire – 09/02/21), previous condition audit (Surf Coast Shire - 2018), heritage assessment (Context Pty Ltd), Structural condition assessment report (Andrew Cherubin & Assoc – 22/01/20). This review is primarily focused the structural engineering aspects of the buildings. The review is not a full compliance or certification review of the original building design or completed construction;
- Meeting with council representative [redacted]) to discuss any reported building issues, maintenance, repair or alteration works undertaken;
- Approximate measurements of existing building layout;
- Measurement of relative internal ground floor levels;
- Three footing exposures;
- Site inspection, visual only, of existing buildings (primarily structural elements) by an engineer and photographic record of accessible areas of note (Appendix C);
- Drawings presenting investigation results are included in Appendix B;
- Preliminary structural design checks and computations on selected key elements;
- Compliance certification of the constructed building components is beyond this scope of works;

- A comprehensive review of the adequacy of original building design (Structural or general NCC compliance) does not form part of this scope of works. Only items raised by client/occupants or observed during visual inspection have been reviewed;
- This investigation and report do not cover pest inspection and/or damage;
- This report is not a building heritage assessment as Yttrup are not heritage consultants or specialists;
- This report does not provide a cost estimate of any remedial works as Yttrup are not quantity surveyors.

Note the primary purpose of this report is to identify any visible structural issues and assess their associated risk. Whilst every reasonable effort has been made to inspect all visible/accessible elements, within the limits of the scope of works, this report is not a complete or exhaustive review of every component of the entire building. This report does not assess the overall risk of the operation of the building.

3.0 BUILDING HISTORY & BACKGROUND

The items discussed in this section are based on a review of reports by others related to the history and heritage of the building and interpretation of conditions observed on site. Therefore, they are assumptions, not necessarily fact, and should be independently verified.

It is understood that the original building (Mechanics Hall) was built circa 1889 on a nearby site on the Deans Marsh-Lorne Road. It was then reportedly relocated to the current site around 1921. From the information provided, it is not clear what the exact extents of the original building were. Given the differing floor and roof framing and internal wall and ceiling lining observed it is quite possible only the central portion of the hall (with higher pitched roof) is the original 1889 building, with the northern and southern “lean to” portions being subsequent extensions. Over the years various additions and modifications have been made. Heritage Assessment by Context Pty Ltd notes extensions/renovations in 1955, 1960, 1975, 1985 and 2000. Based on the information available, a summary of the various building development stages and estimated dates where possible is included in Appendix B (23688_F02).

As detailed further in this report modifications and replacement of the various original hall building components has occurred over the years including but not limited to stumps, floor joists, flooring, external cladding, roof framing, roof sheeting. Only some of the original building fabric remains today which may include some of the roof framing, ceiling lining, some of the wall framing and internal lining, some of the floor joists and bearers.

4.0 OBSERVATIONS

The building is located just off Pennyroyal Valley Road, adjoining Deans Marsh Recreation Reserve (refer to 23688_F01 in Appendix B for overall site plan). The natural topography of the site is very flat with some very gentle slopes from carparking area to the south west towards the southern side of the building and towards the west on the northern boundary.

The hall is generally of traditional timber framed construction with various additions and alterations over the years as detailed in Section 3.0. The main hall consists of a timber floor on stumps. The extensions to the east and south are on raft slabs and the extensions to the north and west are timber floors on stumps. The eastern extension contains a mixture of timber stud and externally rendered brick cavity walls. The newer extensions to the west and south have prefabricated roof trusses. There is corrugated metal roof sheeting to all the various roofs. For further detail of the building's structural elements refer to the framing layouts provided in Appendix B (23688_F07 & F08).

The majority of the building's roof drainage appears to discharge to a series of five interconnected rainwater tanks to the north west of the building.

4.1 DRAINAGE

Overall, the site is relatively flat and drainage of the site and building is poor with multiple issues noted as detailed further below. As the place name suggests the topography and soils in Deans Marsh inherently drain poorly.

4.1.1 Site Drainage

Site drainage is poor with building perimeter surfaces sloping towards the building in several locations.

The carparking area and uphill playground area and recreation reserve general falls towards the building with the relative low point being near the building's southern entry. There is little or no freeboard to the hall southern entry (Photo 02 & 03). Reportedly some concrete pavement works were carried out in this area to provide a localised spoon drain which it would appear directs small amounts of runoff away from the entry. However, there is no outlet or fall away from this low point. Refer to external levels in this area on Drawing 23688_F05 in Appendix B.

There is generally a very slight fall away from the building on the east and southern side and better fall away on the west side. However, there are several areas around the building perimeter where water can pond (eg photo 04) and given the relative flat and marshy soils even with slight surface fall, drainage remains poor with water permeating the upper silty soils and being trapped on the underlying clay as noted in the footing exposures (Photo 10 & 12, Drawing 23688_F09 in Appendix B). There is also likely to be subsurface flow towards the building, following the natural ground slope.

There is a slight drainage depression along the northern boundary with falls towards the west. However, there is a low point to the north west of the rainwater tanks where this drainage depression and a swale from the south converge (Photo 16). Water ponds in this area until the level rises sufficiently to discharge further west. The overflow from rainwater tanks and roof drainage was not evident during site inspection and Legal Point of Discharge for stormwater was not been provided to date. It is assumed stormwater overflow discharges to this area.

The subfloor area accessed was wet on the surface with extensive signs of ongoing rising damp on concrete and timber stumps with efflorescence prolific (Photo 30-33). Ongoing excessive moisture has caused severe concrete cancer in some concrete stumps with failed stumps observed in two locations. Timber stumps were damp to touch.

4.1.2 Roof Drainage

Roof seals, screw rubber seals and flashing were in fair to poor condition with many poorly constructed. Roof sheeting was corroded in places (Photo 04, 22, 25-27). Signs of water ingress were noted internally in several locations (Photo 54, 56, 59-61, 66).

Gutters on the northern side were falling away from the downpipe outlet, with water ponding in the gutter. Several overflow pops had been retrofitted further reducing the capacity of the gutters, with uncontrolled overflow contributing to the site drainage issues around the building perimeter (Photo 08, 23, 24, 26).

It appears the gutter system to the south east corner regularly overflows, with a build up of algae and staining visible (Photo 04).

There is very little head difference between the eaves gutter levels and the inlet to the rain water tanks. The tanks are at different heights and appear to be interconnected. A detailed assessment on the relative tank levels and connection details was not completed at the time of inspection.

4.2 FOOTINGS

There are various footing systems of different ages across the different building stages. These can be broadly categorised into timber or concrete stumps and raft slabs on ground. Refer to drawing 23688_F07 (Appendix B) for the extents of various footing systems and drawing 23688_F09 for footing exposure observations.

As can be seen from the measured relative floor levels on drawing 23688_F03 & F04 there is an overall tilt of the building, with south east side (uphill) being relatively higher than the north west side. There are also relative level differences within specific areas and footing types as discussed further in the following subsections.

As discussed in Section 4.1 site and building perimeter drainage is poor.

A row of trees is located along the northern boundary. Some of the trees along this boundary have been removed in recent years.

4.2.1 Raft Slabs

The raft slab to the south west (circa 2000) appears to be performing well with little or no damage visible to the supported superstructure. Up to 14mm of relative level difference was measured across the slab.

There is some internal cracking to the southern kitchen (circa 1985) and the southern external kitchen door is not operating freely (reportedly varies seasonally) which is likely the result of differential movement across the raft slab (Photo 63-65). Up to 32mm of relative level difference was measured across the slab with the relative low point at the southern entry door.

There is some isolated brickwork cracking to the eastern toilets (reported as circa 1975, previously reported as circa 1999) and there is differential movement visible at the northern junction with adjacent hall building on stumps (Photo 07, 55, 56). Similar damage was noted and reported by this office in 2013 (Our ref 21166 Letter dated 1 October 2013). A footing exposure was completed to the east of this area with the edge beam being in excess of 800mm deep. Up to 30mm of relative level difference was measured across the slab with the relative low point at the north east corner.

4.2.2 Stump Footings

The external levels to the majority of the western perimeter were raised close to floor level with little or no subfloor clearance (with synthetic grass surface to childcare outdoor play area – Photo 18). The south and east sides are abutted by raft slabs and paving slab with no subfloor clearance (Photo 01-06). Only the northern side had subfloor clearance and perimeter access (Photo 08, 13-15). External surface levels to a portion of the northern side had been raised (Photo 10, 35).

Hardwood timber stumps were observed through the central portion of the hall (Photo 33). The northern portion of the hall and northern kitchen had concrete stumps (100-125 square). The stumps were damp to touch and efflorescence was extensive. No integrity testing was carried out on the timber stumps. Severe concrete cancer was visible in some concrete stumps with failed stumps observed in two locations (Photo 30-32, 35).

Up to 70mm of relative level difference was measured across the central hall area with the southern side being higher relative to the northern areas. Some relatively minor cracking was noted on the southern wall (Photo 57, 58, 60). A localised level anomaly was observed in the north west corner of child care nursery with up to 60mm level difference between this room and the adjacent hall. Due to limited access at the time of inspection it is not clear if floor level was set down lower that the adjacent hall. Some localised damage to the skirting was noted in this location (Photo 62).

Two footing exposures were completed on the northern perimeter (Drawing 23688_F09). Stumps were founded 650-850 below ground level. No pad footing was evident at footing exposure 1 and a small pad footing (Ø225x150 thick) was evident at footing exposure 2. Footings were founded 30-150mm into stiff to very stiff clay with overlying soft fill/silt/silty clay. Founding material was wet (Photo 10 & 12).

The footing system to the childcare area and northern store area was not accessible at the time of inspection but is believed to be timber or concrete stumps with timber floor framing. Up to 25mm and 15mm level differences, respectively, were measured across these areas.

In the area to the rear of the stage an unusual footing and floor system was observed. There appeared to be two strip footings running parallel with walls and stairway behind the stage. This supported floorboards on bearers on stumps/stub wall framing. No floor joists were visible.

No ant caps or other termite inspection system was evident throughout.

4.3 FLOOR FRAMING

As detailed in Section 4.2.2 subfloor clearance, inspection access and natural ventilation to the majority of the timber floor area is poor.

The floor boards to the original hall do not appear to be original. The technology to achieve the machined edges visible from the underside would not have existed at the time the hall was originally constructed (over 130 years ago). It appears the floor boards may be tongue and grooved (Photo 34). The southern wing of the hall has different lighter coloured floor boards to the rest of the hall (Photo 50). The northern kitchen has chipboard flooring underlay with a vinyl finish.

Details of the observed floor framing are detailed on drawing 23688_F07 in Appendix B.

In the area to the rear of the stage an unusual floor system was observed. There appeared to be two strip footings running parallel with walls and stairway behind the stage. This supported floorboards on bearers (FB4) on stumps/stub wall framing. No floor joists were visible.

Floor framing to the childcare area and northern store area was not accessible at the time of inspection but is believed to be timber.

4.4 WALL FRAMING

Wall cladding varied in material, style and age around the building. The external cladding was mostly fibre cement weatherboard with some traditional timber weatherboard to the southern side. Refer to external photos in Appendix C for further details and extents. Some localised damage and rot were evident in some locations (Photo 09, 15, 19).

Internal wall lining to the main hall area was a mixture of timber panelling (some possibly original) and plasterboard (unlikely original). Elsewhere the internal lining was typically plasterboard with exposed brickwork to the toilet area. Some minor cracking to brickwork and plaster was noted in some locations (Photo 55, 57, 58, 60, 62- 64). There were no other obvious signs of any major structural issues other than some localised signs of moisture ingress (Photo 54, 56, 59-61, 66).

At the time of inspection access to wall framing was very limited. Condition of framing, bracing and connections/tie downs could not be assessed as this would require destructive investigation.

4.5 ROOF FRAMING

The ceiling to the central portion of the hall is lined with timber ceiling boards, possibly original. The rest of the ceiling linings are plasterboard.

Details of the observed roof framing are detailed on drawing 23688_F08 in Appendix B.

A significant dip in the ridge vertical alignment in the area over the stage can be seen externally (Photo 20). The roof framing is this area (original hall) is framed without struts/web members to create a truss, unlike the remainder of the original pitched roof section. It was reported previously by another consultant that the struts visible elsewhere have been removed. On close inspection there were no signs of nail holes or different rafter colouration in the corresponding strut locations, commonly seen when original framing members are removed. The rafters appear to have rotated away from the ridge board. Timber cleats and packers fixed to the rafters appear to have been retrofitted to prop up roof battens and maintain pitch to roof sheeting, which presumably had deflected excessively (Photo 44, 45). The ceiling joists in this area were deflected excessively when partially loaded by a person (approximately 40-80kg).

Two newer prefabricated trusses (TR5) had been constructed in the ceiling space at the edge of the stage, presumably to support the stage curtain.

The remainder of the central hall roof was framed with struts/web members to create a series of trusses. Horizontal tie rods (TB1) and vertical sag rods (SR1) between the ends of the rafters were visible at discrete locations (Photo 43). Rust was noted on vertical sag rods (SR1) within the roof space. Connections typically consisted of two nails between members.

During the inspection a roof sheet was temporarily removed to the southern “lean to” portion of the hall roof and southern kitchen to assess the roof framing. Access and visibility were limited however the following observations are noted:

- An excessive dip in the roof sheeting is visible externally (Photo 21). The reason for this was not explicitly clear on removal of the roof sheet, however some of the battens had signs of damage and/or defects (Photo 41). The battens were measured as approximately 70x35 on flat at approximately 900-1200 CTS;
- The southern kitchen roof consists of prefabricated trusses (Photo 40);
- The junction between the higher pitched roof and the “lean to” roof of the main hall is supported by a steel truss (TR1). There was rust present on much of the truss (Photo 42). Access to accurately measure the truss was limited however approximate dimensions are provided on the attached drawings. This truss spans approximately 10.5m. Columns, likely timber, are visible internally at the ends of the truss with two exposed bolt heads to the underside of the truss bulkhead. The timber panelling to the truss bulkhead appeared to be pine when viewed from the roof space;
- The sarking is in very poor condition and disintegrates when touched.

The western extension consisted of prefabricated roof trusses with a suspended framed ceiling.

As noted on the attached drawing not all roof framing was accessible at the time of inspection.

4.6 BRACING

As wall framing was typically not visible wall bracing could not be assessed. The only wall bracing noted was some steel angle brace to the eastern wall of the childcare activity area which could be seen from the roof space. There are limited internal walls to the hall area, due to the open space.

Other than Speedbrace to the newer extension to the west and the southern kitchen and some isolated timber braces notched into the rafters to original hall roof, no roof bracing was observed.

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

5.0 DISCUSSION OF SITE OBSERVATIONS & RECOMMENDATIONS

5.1 DRAINAGE

Poor drainage to the site and building is creating multiple building performance issues, as discussed in more detail in the following sections. Remedial works are recommended to resolve the issues noted and improve the overall building performance.

5.1.1 Site Drainage

Poor site drainage (surface and subsurface) can contribute to building performance issues including excessive footing movement as discussed further in Section 5.2, damp environment which compromises the structural integrity of building components, and rising damp with associated mould and health issues. Ordinarily timber subfloor areas are extremely dry and normally experience deep drying. The wet subfloor area observed is indicative of poor perimeter surface drainage, subsurface water and poor ventilation.

The natural fall of the site results in surface and subsurface runoff from the carpark and surrounding area being directed towards the building with little or no formal drainage systems to direct it away from the building.

It is recommended that a surface (concrete spoon drain or grated trench) and subsurface cut-off drain be installed to the southern and eastern sides of the building (uphill sides). Due to limited fall along the length of the building, an underground collector pipe may be required to achieve sufficient fall to a discharge point (ideally 1:100 or 1:200 for Ø225 pipe). The subsurface drain shall consist of a slotted drain in a filter sock in a screening pocket and the drain shall be embedded a minimum of 100mm into the underlying low permeability clay layer. Given the depth to clay and the very limited natural fall across the site, the subsurface drain will need to be directed to a sump and pumped out to the suitable discharge point.

Fall away from the building shall be improved. This shall be carried out in combination with improved subfloor clearance and ventilation. It is recommended that perimeter paving be installed around the building with a spoon drain to collect and discharge runoff away from the building and ensure water cannot pond adjacent to the building.

Council should confirm the official legal point of discharge. Swale drains and/or piped stormwater discharge should be improved to ensure stormwater is directed well clear of the building and also not directed onto the adjoining property.

5.1.2 Roof Drainage

The construction quality of many of the flashings, particularly on the northern side of the roof, is poor with multiple attempts made to seal weak points or obvious locations of water ingress with silicone. The use of silicone in lieu of properly constructed flashings is not recommended as a long-term solution as ongoing expansion and contraction and UV degradation leads to failure of the seals. It is recommended that poorly constructed, non-compliant and failing flashings be replaced.

The rubber seals to roof screws are degraded and roof sheeting is showing signs of degradation with age in places and will need to be replaced at some point in the coming years. Given the multiple points of water ingress throughout the building and the poor condition and construction of many of the roofing components, coupled with the need for upgraded roof bracing as discussed in Section 5.5 and 5.6, it is recommended that the roof sheeting be replaced. Particularly to the northern side, along with gutter remedial works and/or replacement discussed further below.

Gutters with negative falls, ad hoc over flows and areas showing signs of regular overflow should be replaced with correctly sized and graded gutters in accordance with AS3500. Additional down pipes may be required to achieve the required gutter capacity.

The limited head between the eaves gutters and the rainwater tanks may not be sufficient to “push” all of the stormwater though the piped system in more intense rain events, resulting in frequent overflow along the building perimeter. Subject to more detailed investigation into the various eaves gutter levels and the rainwater tank levels, the tank inlet level(s) may need to be lowered to ensure sufficient head is available and risk of overflowing is reduced.

5.2 FOOTINGS

A site classification was not completed as part of this investigation. However, this practice has some geotechnical and structural engineering experience in the area and the soils are known to be made up of moderately (Class M) to highly (Class H1) reactive clays. Under “normal moisture conditions” as described in AS2870, a natural characteristic ground surface movement value, ys, in the order of 40 - 60mm (Class M to H1) is likely for this site. Where abnormal moisture conditions exist, due to factors such as trees close to the structure, poor site drainage, leaking or failed services, the ground surface movement is likely to be much greater.

There are multiple factors on this site influencing abnormal moisture conditions which include poor perimeter drainage, leaking and/or overflowing roof drainage and a row of trees to north. All of these factors are likely contributing to ground movements beyond what would be expected under normal moisture conditions.

The overall tilt of the building is likely caused by swelling of the reactive clays on the uphill side and shrinkage on the relatively drier downhill side. Swelling founding material in response to a build-up of moisture under the footings is common on the uphill side of buildings where surface and subsurface runoff first reach the building and founding material. This is compounded by the presence of rafts slabs and paving which create a naturally humid subfloor environment. This may also be further compounded by leaking roof drainage (Photo 04). The drier subfloor environment created by timber floors and the drying effect of trees causes shrinkage of reactive clay founding material.

Addressing the site and roof drainage and subfloor ventilation issues will help to stabilise the long term moisture conditions in the founding material and is likely to reduce, but not eliminate, ongoing differential movement across the building. If performance issues persist following drainage remedial works, then further mitigation measures such as heavy pruning or removal of trees or installation of an appropriate root barrier may be investigated. Refer to Appendix D for further information on good site management.

Even with the improved site management some ground movement will still occur and likely result in some ongoing damage requiring ongoing repairs. This is a function of natural seasonal ground movements, the ability of each footing system to alleviate the effects of ground movements and different performance between footing systems of different ages and types.

5.2.1 Raft Slabs

As discussed above poor drainage is likely contributing to excessive ground movements in the southern kitchen raft slab which is causing damage and preventing the external kitchen door from freely operating. Given the age of this slab it is quite possible that it was not designed and constructed with sufficient stiffness resist more significant differential movement.

The isolated brickwork cracking to the eastern toilets is relatively minor and within the acceptable performance limits of AS2870, typically less than Damage Category 1 (< 1mm crack width) with some rare instances damage Category 2 (< 5mm crack width). The depth of the raft beam exposed would provide reasonable footing stiffness to mitigate the effects of some ground movements. The differential movement between the toilets on a raft slab and the adjoining hall with timber floor on stumps is to be expected due to the different type and age of footing systems and the different founding material moisture conditions the two footing systems create.

As discussed further in the previous section improvements to drainage may improve the performance of raft slabs, however some ongoing movement and associated minor damage must be expected.

5.2.2 Stump Footings

Adequate subfloor ventilation to timber floor systems is required to ensure a dry subfloor environment which ensures stability in ground moisture conditions and associated footing movements, adequate durability of timber framing and minimising conditions for rising damp, mould and associated health concerns. Adequate vents on all sides of a building allow natural ventilation via cross flow to occur.

The subfloor area to the central hall area is completely enclosed to the south and the east by raft slabs and partially enclosed to the west and portions of the north by raised external levels. This severely impedes natural cross ventilation. Combined with drainage issues detailed in previous sections, this has resulted in a damp subfloor area. Improvements to ventilation are required to improve subfloor conditions. This includes lowering of external levels to the west and north to provide adequate subfloor clearance and venting and likely the introduction of mechanical ventilation to account for the lack of natural ventilation available on the south and east sides.

The condition of concrete stumps observed was poor with severe concrete cancer evident. This is due to the excessively damp and wet subfloor environment. Replacement of the concrete stumps will be required to ensure the long-term integrity of the floor support system.

Whilst integrity testing of the main hall timber stumps was not carried out, the ongoing damp conditions are likely to have shortened their lifespan. Subject to further more extensive investigation it is likely they would also need to be replaced to ensure the long-term integrity of the floor support system.

Ant caps or other termite inspection system shall be installed during any restumping works as well as allowance for future relevelling.

The measured relative levels across the newer timber floors extensions appeared reasonable. However, they are still affected by the drainage issues and to a lesser extent the ventilations issues.

Poor drainage as detailed in previous sections and subfloor ventilation are likely contributing to unstable moisture conditions and excessive differential footings movements and should be addressed.

The two footing exposures completed to the stumps indicate minimal pad footings and minimal embedment into suitable founding material (stiff to very stiff clay with overlying moist to wet soft fill/silt/silty clay). Based on the footing exposures some stumps/pads supporting a lesser floor area would just have sufficient bearing area to accommodate domestic design loads (1.5kPa/1.8kN) without excessive settlement, if founded into stiff clay. However, stumps/pads supporting a greater floor area and/or roof loads would likely exceed the allowable bearing pressure of the founding material. Furthermore, the imposed design loads required by current Standards (AS1170.1) for this building are much higher that domestic (eg B - Communal Kitchen 3kPa/2.7kN; C3 - Museum Floors & Art Galleries for exhibition purposes, C4/5 Dance Halls & Studios/Concert Halls 5.0kPa/3.6kN). Therefore, larger pad footings would typically be required to avoid exceeding the allowable bearing pressure and resultant excessive settlement (as a guide min 200 thick x 450 diameter). Under larger concentrated loads and/or stumps/pads subject to significant uplift forces (eg under columns supporting steel truss - TR1) larger footings would be required.

The minimal embedment into suitable founding material may be an issue particularly when the founding clay material is subject to excessive moisture which can reduce allowable bearing capacity.

Inadequate bearing of footings results in excessive settlement. This may be a compounding factor in the lower floor levels observed on the north side of the building. Drainage improvements coupled with adequate pad footing sizes and embedment (as a guide min 100mm into stiff clay) would ensure adequate bearing capacity

5.3 FLOOR FRAMING

Current Standards (AS1170.1 – Structural Design Actions - Part 1: Permanent, imposed and other actions) require that floors are designed for certain imposed loads based on their intended and/or possible usage. The categories applicable to the different areas in this building by default are as follows:

- B – Communal Kitchen 3kPa/2.7kN;
- B – Commercial Kitchen 5.0kPa/4.5kN;
- C3 – Museum Floors & Art Galleries for exhibition purposes 4.0kPa/4.5kN;
- C4/5 – Dance Halls & Studios/Concert Halls 5.0kPa/3.6kN;
- C5 – Stages in public assembly areas 7.5kPa/4.5kN;

It is noted that C5 Stage category loads for a small community hall are unlikely to be realised. However adequate signage shall be installed to ensure that very large loads, particularly point loads (eg theatre props or exhibition pieces), are not permitted, as detailed further below.

Preliminary structural analyses were carried out on structural floor framing members shown on 23688_F07. Only a limited sample of floor framing members was accessible during the inspection and have been assumed to be representative of the typical floor framing. Due to the unknown species and grade, members have been assumed to be minimum Grade F7 for obvious pine members and F8 for members likely to be some form of hardwood. The members were typically checked for a design load of 5.0kPa/3.6kN. Typically, members had sufficient stiffness and strength capacity.

However, FB2 (50x100 and 45x70 on flat) does not have sufficient stiffness or strength to accommodate the required design loads and shall be upgraded to similar to adjacent floor bearers.

Floor joists shall be retrofitted to the area to the rear of the stage as the flooring would not have the capacity to span between bearers (FB4). The exact extent of area requiring floor joist upgrade needs to be confirmed on site.

The chipboard flooring to the kitchen area would not have sufficient capacity to accommodate concentrated point loads, as required by current Standards for either communal (3.0kPa/2.7kN) or commercial kitchens (5.0kPa/4.5kN). It is recommended that this flooring be upgraded, particularly if any upgrades to the kitchen and equipment are proposed.

The timber floor boards to the main hall area are of unknown timber species and grade. For the purposes of preliminary computations, the floor boards are assumed to be hardwood of minimum F14 grade, based on appearance. Subject to confirmation of grade, the floor boards have sufficient strength capacity to accommodate lower loads (4.0kPa/2.7kN). However current Standards would require the main hall floor to be designed for higher loads by default (5.0kPa/3.6kN) and F14 floorboards do not have sufficient capacity to accommodate these higher loads, particularly the concentrated point load. Preliminary computations indicate floor boards of strength grade of F22 or higher would have sufficient capacity. Remedial options include:

- Verification of floor board grade of F22 or higher. This would require species testing and grading by a qualified professional;
- Upgrade the flooring by installing a structural underlay and relaying the floorboards on top (as a guide 15mm F11 structural plywood), or installing structural flooring on top of the existing floorboards;
- Implement strict load controls to avoid larger point loads. This would include appropriate permanent signage stating no concentrated point loads greater than 2.7kN (275kg).

5.4 WALL FRAMING

Where localised damage and rot is evident, weatherboards should be repaired or replaced as appropriate. During cladding remedial works underlying wall framing shall be inspected to confirm acceptable condition. In older buildings it is commonly found that wall framing behind damaged cladding is also degraded and requires replacement.

Prior to undertaking any plasterwork and brickwork cracking repair, the subsurface moisture conditions should be allowed to largely stabilise following the completion of drainage remedial works detailed in Section 5.1 and 5.2. As a guide this would take a minimum of 12-24 months with normal weather conditions. During this period some cracks may change, open or close.

It is recommended that some additional investigation works be carried out to expose (remove cladding) some key areas of wall framing to assess the wall framing condition and tie down connections. For buildings like this, tie down upgrade works are commonly required.

This section shall be read in conjunction with sections on bracing (Section 4.6 and 5.6)

5.5 ROOF FRAMING

Remedial works are required to the roof framing over the stage area given the clear signs of excessive deflection and poor structural performance. To remedy the existing framing additional struts/web members are required, similar to the remainder of the original central hall roof, to create a truss. All roof and ceiling members will need to be jacked to a level position prior to installing struts/web members.

A preliminary structural analysis of the central hall roof framing/truss (TR2) was carried out. It was found if horizontal restraint was available to ends of the rafters (at TR1 location) the current framing was satisfactory. If horizontal restraint is not available to the ends of rafters, deflections and/or "roof spread" at the ends of the rafters is excessive and members and connections may become overstressed. In its current structural form, horizontal restraint is likely provided by a combination of the steel truss (TR1), the existing lean-to roofs and the discrete tie rods (TB1). However, some issues with the current structural system and adequate horizontal restraint to TR2 include:

- TR1 capacity is already exceeded due to vertical load alone regardless of any additional horizontal load from TR2, as discussed further below;
- Little or no roof bracing to transfer horizonal loads to restraining bracing walls. It is likely the ceiling and/or roof sheeting is acting as a diaphragm in some form to transfer bracing loads. However current Standards do not permit the use of cladding as bracing unless specifically designed to do so due to the risk of the cladding being overloaded and damage and/or failure occurring;
- The load path between ends of TR2 rafters and TB1 ties rods is currently unknown;

- Notches in some rafters for timber roof braces resulting in reduced capacity and stress concentrations.

Therefore, remedial measures required include:

- Provision of suitable strap bracing to central pitched roof and adjoining lean-to roofs to transfer horizontal reactions from TR2 into bracing walls (in addition to building bracing loads as discussed in Section 5.6);
- Exposure of TR2 rafter end connections and upgrades as required to ensure adequate load path into restraining lean-to roof members;
- Upgrading of roof and wall bracing to provide additional horizontal restraint (in addition to building bracing loads as discussed in Section 5.6);
- Treatment or upgrade of corroding sag rods (SR1) within roof space with suitable paint protection system;
- Upgrade of discrete rafters where notches for timber braces deemed unacceptable. The exact details and extent of upgrades would need to be determined following more extensive investigation and computations. However, it is likely that an additional similarly sized rafter would need to be nail laminated to the existing where rafters are notched.

The cause of the excessive dip in the southern lean-to hall roof should be further investigated. It is likely that battens in the area will need to be upgraded.

It is possible that the northern and southern “lean to” portions of the hall were constructed after the original central portion of the hall. If this is the case it is likely side walls were removed and replaced with the steel trusses (TR1), with newer pine panelling retrofitted to conceal the truss.

A preliminary structural analysis of the steel truss (TR1) was carried out. It was found that the internal forces in the truss components were excessive for sizes measured on site (with very limited access). Therefore, the truss is deemed structurally inadequate and in need of remedial works or replacement. Given the extent of corrosion visible on the truss it would likely be more economical to completely replace the truss with a new suitably designed truss or beam (including factory applied corrosion protection system) than to attempt upgrade works, including corrosion protection remedial works.

The sarking should be replaced throughout the older portions of roof.

There were no obvious structural issues with the western extension roof framing. No further computations or checks have been completed for this area.

5.6 BRACING

Given the age of the building and the ad hoc nature of the various modifications and extensions it is quite possible that walls and associated bracing capacity have been removed or modified over the years, thus reducing the overall ability of the building to resist horizontal loads (primarily wind). The limited number of internal walls to the hall results in the relatively high racking forces in the available walls. Given the age of the building and the ad hoc nature of various building modifications it is unlikely that the bracing capacity of the walls in their current condition is sufficient for the required bracing loads. In addition to this, as discussed in further detail in Section 5.5 additional horizontal loads from TR2 need to be restrained by bracing walls.

It is highly likely bracing upgrades, particularly to the hall walls, including provision of structural plywood sheeting, improved tie down and possibly footing upgrades, would be required to provide sufficient lateral restraint in accordance with current Standards. The extent of required upgrades would need to be confirmed following more intensive and destructive investigations and more detailed computations.

Based on the limited investigations it appears that the newer building additions have adequate roof bracing. The extent of wall bracing is unknown, however there is a good distribution of walls to provide bracing restraint. Detailed inspection and design checks of these areas have not been completed.

To ensure the hall roof is adequately braced, retrofitted Speedbrace is required throughout the roof. To determine the exact layout of bracing more detailed design is required, noting the speed brace is also required to ensure sufficient horizontal restraint is provided to pitched hall roof trusses (TR2).

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

6.0 CONCLUSION

Numerous issues which require remedial works have been identified as part of this investigation. A non-exhaustive summary of more significant items is as follows:

- Site drainage improvements
- Roof drainage remedial works
- Subfloor ventilation upgrades
- Restumping & pad footing upgrades
- Flooring upgrades and/or load limitation controls
- Possible wall tie down upgrades
- Roof framing remedial works to area over stage
- Steel truss (TR1) replacements
- Wall bracing upgrades
- Roof bracing upgrades

For reference a diagrammatic representation of these items is provided on drawing 23688_F11 in Appendix B. Refer to full report for more comprehensive details.

The recommendations provided in this report are based on limited and preliminary assessment and structural computations. Should the client wish to carry out remedial works, further investigation and design works are required to fully inform and provide definitive details of required remedial works and building approvals.

Whilst this office cannot comment on the heritage values of the building and its various components, we do note that it appears that only a portion of the central hall form and some discrete building components are truly original (1889) with extensive replacement of components, building modifications and ad hoc building extensions conducted over the years.

Considering the extent of required remedial works and ongoing maintenance, to ensure the building remains compliant and suitable for use into the future, the client may find that complete replacement provides better whole of life value. The feasibility of this however is subject heritage assessment, advice and approvals by the relevant authorities as well as a cost comparison by the client.

Hoping the above meets your requirements and please contact the undersigned if you have any further queries.

Brian Kirwan
Senior Structural/Civil Engineer

Nathan McLaren
Chartered Professional Engineer
Director
P.J. YTTRUP & ASSOCIATES PTY. LTD.

10 September 2021

APPENDIX A

Previous Reports & Background – Client Supplied

- Structural engineering heritage assessment brief (Surf Coast Shire – 09/02/21),
- Previous condition audit (Surf Coast Shire - 2018),
- Heritage assessment (Context Pty Ltd),
- Structural condition assessment report (Andrew Cherubin & Assoc – 22/01/20).

Structural Engineering Heritage Assessment

Deans Marsh Community Hall

Amendment Register

Issue	Date	Details	By
1	09/02/2021	2021 Structural Engineering Assessment	[redacted]

1 Introduction

Surf Coast Shire own and maintain a number of buildings throughout the region. Based upon our Building Condition Audits and community Customer Request Management (CRM's), some buildings require a further detailed investigation. At times these buildings and building components require a structural assessment to assess for stability, structural integrity, safety, failure mechanisms, where required condition and heritage value/ impacts.

2 Purpose

The primary purpose of the structural engineering assessment is to gain an understanding the structural integrity of the building in relation to heritage requirements and whether the ongoing and upcoming renewal and maintenance costs exceed the value of the original structure. The outcome of the assessment may be used to determine whether Council may decommission the building.

3 Project Scope

Undertake a structural engineering assessment of the ***Deans Marsh Community Hall*** as shown in Figure 1, located at the Deans Marsh Recreation Reserve, Deans Marsh as identified within Table 1.

The structural engineering assessment is to include:

- A statement that the assessment has been carried out according to the conservation practices of the Australia ICOMOS Burra Charter. The Structural Engineering Assessment should especially address Articles 19 and 20 of the Burra Charter and interpret them in relation to the structural analysis being carried out.
- Whether the building fabric is structurally sound even if it may not strictly comply with the relevant Building Legislation (and how it could be made to comply).
- An assessment of the fabric in disrepair and requiring replacement, and particularly whether the extent of replacement fabric is substantial (including much of the roof and wall structure) or incidental and routine (such as replacement of roof and wall cladding or restumping). The method/s of repair should also be outlined.
- A cost estimate for repairing the building and whether this cost could be considered to be reasonable (when compared to a replacement building of the same size and construction, and given the expectation that building repairs are often more expensive). Any cost estimates should include demolition costs for the cost estimate for a new dwelling.

Table 1 Building list for assessment

Reserve	Asset ID	Description	Address
Deans Marsh Recreation Reserve – Community Hall	39465	Weatherboard, mixed foundations	20 Pennyroyal Valley Road, Deans Marsh

4 Building History

Deans Marsh Community Hall is located within a heritage overlay and has intrinsic value to the local community and wider region.

In recent years, the maintenance and upcoming renewal requirements are the building are increasing significantly in conjunction with the inclusion of a number of add-on structures over the years with varying foundation types.

This has led to a number of issues noted through Council's CRM maintenance system, condition audits and previous structural assessments.

The following documents have been included for reference:

- Section 7 – Previous Condition Audit from 2018
- Section 8 – Heritage Citation
- Section 9 – 2020 Structural Engineers Assessment

4.1 Heritage Advice

The below heritage advice is based on potential demolition of the building:

The Deans Marsh Public (Community) Hall has local significance and is identified as HO46 in the Schedule to the Heritage Overlay in the Surf Coast Planning Scheme. No external paint controls or internal alteration controls apply, so there is no heritage listing (from a planning perspective) in relation to the stage curtain.

The heritage citation prepared by Context Pty Ltd as part of the Selected Lorne/Deans Marsh Heritage Place Assessments Report notes the alterations and additions to the hall building, and yet it was still heritage-listed with these alterations and additions known. Further change was made in 2000, which no doubt was needed at the time (although did not receive heritage support).

The purpose of the heritage overlay at Clause 43.01 of the Surf Coast Planning is:

- *To implement the Municipal Planning Strategy and the Planning Policy Framework.*
- *To conserve and enhance heritage places of natural or cultural significance.*
- *To conserve and enhance those elements which contribute to the significance of heritage places.*
- *To ensure that development does not adversely affect the significance of heritage places.*

Based solely on the information in the heritage study, complete demolition of the Hall would have an adverse affect on the significance of the heritage place and therefore be contrary to the purpose of the heritage overlay (and not accord with the Decision Guidelines at Clause 43.01-8). A planning permit is required and based solely on the information you have supplied, heritage support is unlikely.

Repairs and restoration including restumping, recladding walls and roofs, and addressing falling and rising damp, are typical conservation issues affecting heritage buildings. Regular maintenance is therefore critical.

There are opportunities to remove existing additions and replace in a manner more sympathetic to the building, as well as retain and repair the principal gabled portion. From a heritage viewpoint, works carried out on or behalf of a Municipality under $1M are planning permit exempt (but demolition is not).

I am concerned about the message complete demolition of the building will send to the broader Surf Coast community, particularly owners of heritage buildings that are included as heritage overlays.

Aside from the above, if complete demolition is pursued, I would urge you to engage a Heritage Consultant and a Structural Engineer to prepare a Heritage Impact Statement. The heritage impact statement would need to address:

- ***Significance:*** *whether the documentation to support the significance of the place is accurate. This documentation includes the statement of significance in the heritage study and the heritage clauses in the Surf Coast Planning Scheme.*
- ***Integrity:*** *the intactness of the heritage asset and whether this influences the statement of significance in the heritage study.*

5 Outcomes

The expected outcome of the structural engineering assessment is as follows:

- Structural engineering report adhering to the requirements outlined in Section 3.

6 Map/Photos of Building

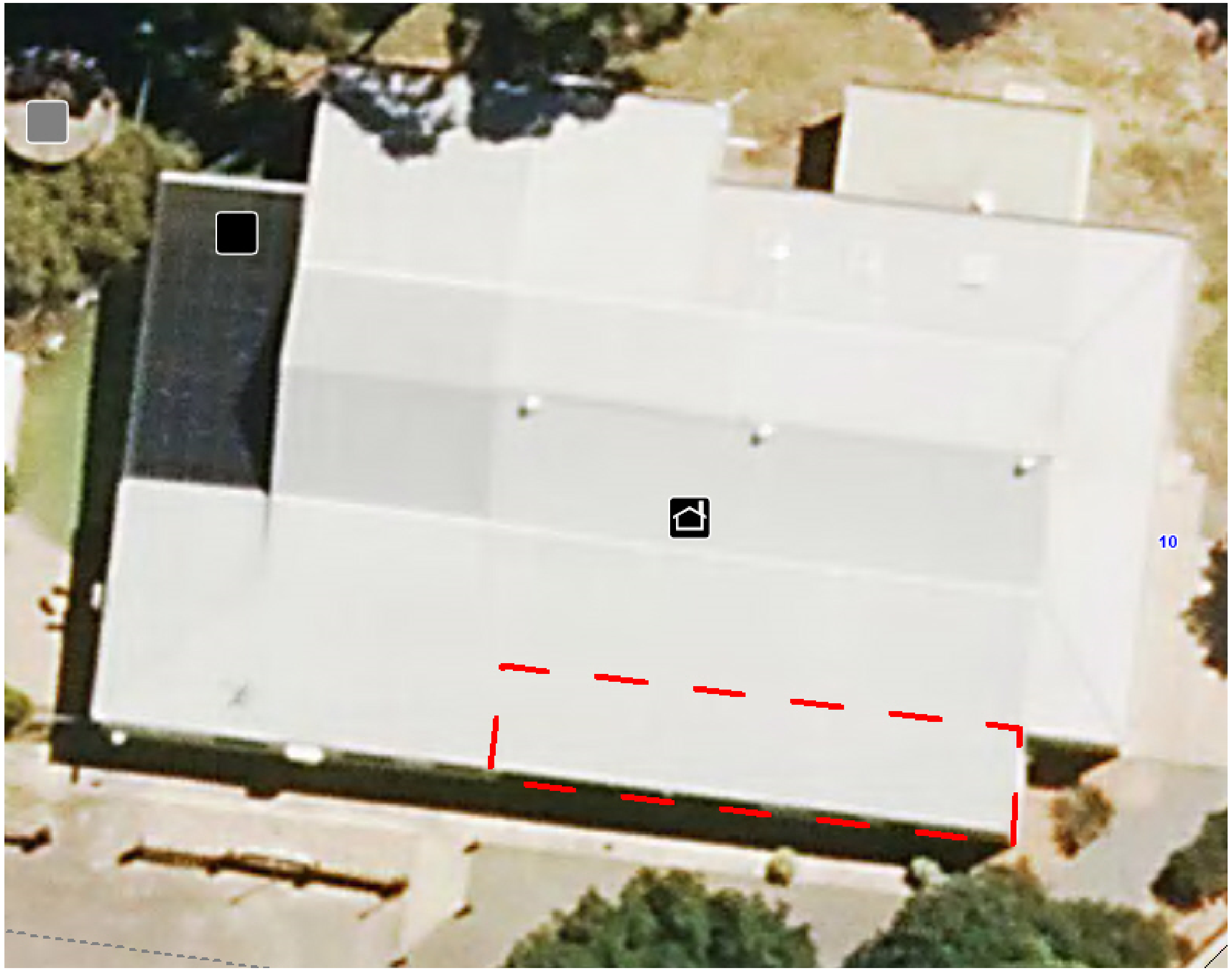


Figure 1 Deans Marsh Recreation Reserve – Community Hall

7 Previous Condition Audit

Table 2 2018 Condition Audit

Component Group	Component Type	Component	Asset ID	Condition Grade (% split) & Assessed Remaining Life 1		2		3		4		5		Qty	Unit	Rate	Comments	Base Life
Structure	Floor Surface	Carpet	76855	100%	30									126	m2		Damage to fabric.	50
Structure	Floor Surface	Concrete	76856	30%	35			70%	15					70	m2		Main front patio area has some fine surface cracks throughout. Some minor cracks. Some discolouration and minor staining to this area. Has been noted by Council that water during Winter remains under the building.	50
Structure	Floor Surface	Timber	76857			100%	20							212	m2		Deteriorating/wearing.	50
Structure	Floor Surface	Vinyl	76858	59%	30	35%	20	4%	15	2%	5			82	m2		Wear & tear and minor to moderate staining.	50
Structure	Internal Wall Surface	Laminate	76859			95%	20	5%	15					50	m2		Minor deterioration and some marks. Small holes to one panel.	50
Structure	Internal Wall Surface	Plaster	76860	66%	30	25%	20	4%	15	5%	5			472	m2		Wear & tear, paint loss and minor to large dents. Minor to heavy cracks.	50
Structure	Internal Wall Surface	Timber	76861			30%	20	50%	15	20%	5			275	m2		Minor deterioration and wear & tear. Some bubbling of paint, damage. Many large cracks in the joints of timber panels. Some large cracks through some timber panels.	50
Structure	External Wall Surface	Timber Facia	76862			100%	25							115	m2		Weathered.	50
Structure	Internal Wall Surface	Brick	76863	100%	30									42	m2		In good condition.	50
Structure	External Wall Surface	Rendered	76864	98%	40			2%	15					41	m2		3mm cracks observed.	50

Component Group	Component Type	Component	Asset ID	Condition Grade (% split) & Assessed Remaining Life										Qty	Unit	Rate	Comments	Base Life
				1		2		3		4		5						
Structure	External Wall Surface	Timber Painted Weatherboards	76865	30%	30	40%	20	20%	15	10%	5			320	m2		Minor deterioration and wear & tear. Minor splitting in corners of walls. Minor staining and cracking of weatherboards. Cracks/splits and some dislodged on the west elevation. Large gaps/cracks in corners of walls. A section missing on back wall lower area.	50
Structure	External Wall Surface	Timber Floor Void Cladding	76866			70%	20			30%	5			320	m2		Some panels have rotted and are damaged.	50
Structure	Doors	Timber (x23)	76867	50%	30	20%	20	25%	15	5%	5			68	m2		Wear & tear. Weathering. Door slightly difficult to close. Paint loss, chips, dents and loose handles & hinges. Corrosion on handles, closers and hinges. Disconnected lock. Latch missing. Doors do not close.	50
Structure	Doors	Aluminium / Glass (x2)	76868			80%	20	20%	15					4	m2		Minor wear & tear and deterioration. Minor corrosion to some fixtures and fittings. Some damage to powder coating finish of aluminium frames, around door locks.	50
Structure	Doors	Retractable Flyscreen Doors (x1)	76869	80%	30	20%	20							2	m2		Minor issues with the operation, mesh bulges when closing.	50
Structure	Doors	Security Doors (x2)	76870	30%	30					70%	5			4	m2		Torn flyscreen mesh, required replacement. Door binds on internal floor surface. The kitchen flydoor jambs on frame and catches with door handle.	50
Structure	Windows	Aluminum / Glass (x30)	76871	80%	40	10%	20	5%	15	5%	5			55	m2		Minor wear & tear and deterioration. Minor cracks in joints to timber window frames and sashes. Some loose timber window winders. Rotting of timber sills. Some damaged aluminium flyscreen frames.	50
Structure	Windows	Aluminium Roller Shutters (x3)	76872	90%	30			10%	15					4	m2		Minor surface corrosion to outside fittings of external roller shutter. All shutters unable to operate. Unsure on how to operate.	50
Building Fit Out	Window Furnishings	Blinds	76873			40%	20			60%	5			7	Each		Venetian blinds working with minor wear & tear. Roller blinds not working, require replacement or repair.	50

Component Group	Component Type	Component	Asset ID	Condition Grade (% split) & Assessed Remaining Life										Qty	Unit	Rate	Comments	Base Life
				1		2		3		4		5						
Building Roof	Internal Surface	Plastic - Laserlite	76880	100%	30									50	m2		In good condition.	50
Building Roof	Internal Surface	Plaster	76881	87%	30			10%	15	3%	5			281	m2		*Main Hall area - no measurement provided in 2015 data. Bulging from movement of trusses. Mould and cracks.	50
Building Roof	Internal Surface	Timber Ceiling	76882			50%	15	35%	10	15%	5			20	m2		*Main Hall area - no measurement provided in 2015 data. Paint in good condition. Minor cracks in timber panes. Spits and gaps in joints. A few cracks present.	50
Building Roof	External Surface	Metal - Steel	76883			90%	20	10%	15					614	m2		Weathering, surface corrosion and dents.	50
Building Roof	External Surface	Plastic - Laserlite	76884			100%	20							614	m2		Weathering.	50

8 Heritage Citation

HERITAGE ASSESSMENTS

Site Name: Deans Marsh Public Hall and Recreation Reserve **Site No:** 163

Address: Pennyroyal Valley Road , Deans Marsh

Approx. Date: 1889

Integrity: Fair **Significance Level:** Local

Survey Date:

05/33

History

The Deans Marsh Public Hall was built in 1889 as a Mechanics Institute and Free Library. The original site was on the Deans Marsh-Lorne Road opposite the 1870s Deans Marsh Hotel. (Millard 1985: 22-23)

The Mechanics Institute movement began in Britain in the early 19th century. Its aim was the education and enlightenment of 'mechanics' or workers involved in the new industrial processes. The first Australian institute was founded in Hobart in 1827. Port Phillip (the early name for Victoria) had an institute in 1839, and the first purpose-built building by 1842. (Land Conservation Council 1996)

The Institutes appealed to many social groups. There were lectures for adults, concerts, entertainments, reading rooms and usually a free library. They were built in most country towns of any size and were often the only public building in such towns. Country Mechanics Institutes were usually simple rectangular structures, of brick or timber, with gabled iron roofs. They usually consisted of one or two small rooms, a large hall and possibly a kitchen. A supper room and stage were sometimes added later.

In Victoria, after Melbourne, Geelong and Portland, Mechanics Institutes were established at Warrnambool and Hamilton in the 1850s and Port Fairy in 1865. There was one at Charlton in 1879. A Mechanics Institute was built at Cobden in the 1880s. (Land Conservation Council 1996: 71-72)

The Deans Marsh Mechanics Institute was known until recently as the 'Mechanics Hall'. A free library existed there from 1889 to 1897. The building was also used for dances. The music in the period 1910-20 was provided by Ted Lowe (accordion), Emma Smith and Miss Cahill (piano) and 'Nipper' Ryan (piccolo). The MCs were Bert Walter, Mick Brennick and Harry Millard. There were concerts, too, at which local residents performed and, during the First World War, the Rev. Alex Pearce, Church of England Minister at Deans Marsh, organised concerts for patriotic purposes. These included 'farewell' and 'welcome home' dances for soldiers. The churches held Tea Meetings and High Teas in the Hall. (Millard 1985: 49)

The stage curtain in the hall made by members of the Country Women's Association in the 1940s is now in the Museum of Victoria. A new curtain will be produced in 2000-2001 by an Artist-In-Residence, who will organise members to create the work with the assistance of a Government Grant obtained by Julie Dyer, Surf Coast Shire's Arts Development Officer. (Stewart 2000, pers. comm.)

In 1921, the hall was moved to its present site in the Deans Marsh Soldiers Memorial Park in Pennyroyal Valley Road. Those who supported the move "felt that it was too close to the hotel, which was allowed to sell liquor till 9 pm at that time, thus interferring with entertainments in the hall". (Millard 1985: 22)

The hall has undergone several changes in recent times. The supper room was extended in 1955 and a ladies' cloakroom was added in 1960. A new front was added to the building in 1975. Later, in 1985, a new kitchen was built with a grant of $8,500 from the Red Cross. This was made in recognition of the part the hall played as a relief centre during the Ash Wednesday fires, and to help equip the hall as a base for any future disaster. (Millard 1985: 50) There are memorial plaques in the hall, honouring district men who served in 1914-18 and 1939-45 wars. (Stewart 2000, pers. comm.)

The plaque on the gates of the Recreation Reserve reads: Deans Marsh Soldiers Memorial Park World Wars 1914-1918, 1939-1945. 'Lest We Forget'. The reserve has been used for a number of memorable football matches, including when Deans Marsh became premiers in the Polwarth League in 1911 and 1929. Cricket was also played there for many years. Golf was another sport played on the reserve and, in earlier times, wood chopping and sheaf tossing as well as walk, trot and gallop races. Last year, a Heritage Day was held in the reserve with wood chopping and bullock team events. (Stewart 2000, pers. comm.)

Description

Small weatherboard hall with rectangular floor plan and iron roof. Unsympathetic extensions in brick and fibro sheeting have been added to the front and side elevations, obscuring the original entrance to the hall, although its original form and fabric of the late 19th century building are still evident. The hall is set alongside the Recreation Reserve which comprises an oval, fibro building (c.1920s), memorial gates, and cypress plantings along the side and rear boundaries. A large bundy or long-leaved box tree stands at the front of the site. The plaque on the gates reads 'Deans Marsh Soldiers Memorial Park World Wars 1914-1918, 1939-1945', and 'Lest we forget'.

The public hall is the former Deans Marsh Mechanics Institute (c1889) which was once located on the Deans Marsh-Lorne Road opposite the hotel in 1920. It was shifted due to pressure from the temperance movement because of its location opposite the hotel. The hall was used as a depot during the Ash Wednesday 1983 fires. It once had a stage curtain embroidered by the CWA: the curtain is now in the Museum of Victoria.

Additions and alterations were made to the hall in 2000 (Permit 00/0174) to provide a community house facility for the community. The extension was to the east and south sides comprising

Hardie weatherboard cladding and skillion style metal zincalume roof.(Surf Coast Shire)

Statement of Cultural Significance

The Deans Marsh Public Hall and Recreation Reserve are of local significance because of their historical, architectural and social values. Despite a series of unsympathetic extensions and modifications, the public hall is recognisable as the former Mechanics Institute and Free Library, moved to the present location in 1921. As a Mechanics Institute and Public Hall, the building has served as an important community meeting place for over a century. Its importance to the Deans Marsh community was underscored in recent times by its important local role in the Ash Wednesday fires in 1983 (criteria A4, G1). The Recreation Reserve is also of local significance for its social values as a memorial to soldiers in both world wars, and its use for football and cricket matches as well as wood chopping and sheaf tossing events (criterion G1). Significant elements include the public hall (particularly its 19th century form and remaining fabric, but not including the mid/late 20th century extensions), the sport grounds, the adjacent fibro rooms, the memorial gates, and the cypress boundary plantings.

References

Land Conservation Council, Historic Places Special Investigation - South-Western Victoria: Internal records - no field survey CL0005, 1997
Land Conservation Council, Historic Places Special Investigation - South-Western Victoria - Descriptive Report, 1996
Millard, R., The Deans Marsh Story, Geelong, 1985
Stewart, L., pers. comm., 2000
Stewart, M., pers. comm., 2000
Surf Coast Shire, Advice from Mark Harwood, 16 September 2002

Recommendations

Planning Scheme

05/34

05/35

9 2020 Structural Engineers Assessment

Condition Assessment Report

Client: **Surf Coast Shire**

Attent: [redacted]

Project;

Deans Marsh Community Hall Structural Investigation

Site Addresses:

20 Pennyroyal Valley Rd, Deans Marsh

Inspection By:	**Andrew Cherubin**	Report Date:	**22nd January 2020**
ACA Project Reference No.	**19-336**	Inspection Date:	**31st October 2019**
Report No:	**Rept-01**		

EAST SIDE

NORTH SIDE

Table of Contents

1.0 EXECUTIVE SUNMMARY

The overall structural stability is satisfactory and safe.
There are elements of the building that require remediation and modification that will have a reasonably significant cost, such as surface drainage and sub-floor ventilation.

The roof sheeting has not been installed correctly. The north side of the pitched roof area does not have a bottom support batten. This has resulted in sheet deformations due to persons accessing the roof. This batten should be installed or the area excluded for access until the roofing is eventually replaced and the batten can be installed.
The roof of the west addition was installed at a lower pitch than the original and some ad hoc work was undertaken to align the two planes on the south side. On the north side, this alignment work was not undertaken and there is a "step" in the roof planes. If no leaks are apparent, this is a visual flaw rather than a structural defect.
Some modifications to the original trusses appears to have been undertaken at some point in the history of the building. These modifications do not appear to have any detrimental effect at this stage.

The hall area has a "tilt" in its floor, high at the south and low at the north. Although a line of trees are located on the north boundary and these trees are expected to be significantly contributing to the tilt, it appears that relatively shallow stump pad founding may also be the cause of the settlement. The upper soils appear to become saturated during wet periods and they would then lose their bearing capacity resulting in footing settlement. It is this authors opinion that a combination of shrinkage due to the trees and periodic low bearing capacity may be the cause of the uneven settlement.

The sub-floor ventilation is poor and may result in future issues of sub-floor timber decay.

The carpark area surface water flows towards the building without effective drainage. The carpark should be provide with a surface drainage system. Sub-surface drains may be required to lessen the potential for soil saturation under the building.

The concrete floors to the east of the building have also moved significantly. Some have been underpinned in 2016/2017. The outcome of the underpinning should be monitored and can be used as a guide for future remedial works.

2.0 CLIENTS SCOPE:

Andrew Cherubin & Associates was engaged to undertake a condition assessment of community hall at number 20 Pennyroyal Rd Deans Marsh.
The specific scope is to assess the following items as a minimum;

- Foundation movement
- Roof leakage leading to reduction to structural integrity
- Stability of the structure
- Expected remaining useful life
- If any component is unsafe, how to make and maintain until rectification works can be undertaken and
- Recommendation of potential future solutions to be investigated.

The results of the assessment is anticipated to identify and highlight any issues such as risks, safety concerns and reduced useful life and the expected outcomes are;

- Stability and expected remaining useable life of the structure
- Any identified issues
- Recommendations of potential future solutions to be investigated and
- Remediation recommendations to make safe if required.

2.0 GENERAL LIMITATIONS:

The inspection undertaken was generally a visual non-destructive inspection. Furniture, fixings and the like were not moved during the inspection, except at one location, where a floor vent was removed to gain access to the sub-floor area for review.
Refer Appendix B for limitations and disclaimers.
A hazard assessment was not undertaken as part of this report. It is understood that an asbestos assessment is not required.
If a hazard, other than presence of asbestos, was noted during the inspection, then this will be included in this report for completeness and safety.

3.0 INSPECTION AND DOCUMENTATION:

Andrew Cherubin undertook the site inspection on the 31st October 2019. The weather on the day of the inspection was "dry and fine".
The inspection was a non-destructive visual inspection. Refer Appendix B for general information on limits on locations accessed.

Floor and paving levels were taken to ascertain the degree of movement of the building. It is assumed that the original building and extensions were all level at time of construction. It is expected that buildings will move to some degree over time. This movement may result in building distress, however the degree of distress is dependant on the building fabric and degree of movement. Current footing standards allow some degree of movement without being considered as defects.
Levels of the external paving to the south were also recorded. The paving is expected to have falls to allow rainwater to flow away from the building. The levels were examined to determine if sufficient falls has been provided to protect the footings.

The following document relating to the building was provided or available;

- Deans Marsh Structural assessment (part only). Version 1.0 October 2019. Provided by Surf Coast Shire.
- Site Inspection Report dated 16 June 2016 by Andrew Cherubin and Associates.

4.0 GENERAL DESCRIPTION:

The subject building is a located at the north east corner of a council reserve at 20 Pennyroyal Road Deans Marsh. When originally constructed, the building appears to have been a simple rectangular structure with an approximately 30 degree pitched gable ended roof and timber weatherboard clad external walls. The internal wall cladding is timber lining boards and the floor is of timber frame construction.
The building has had multiple extensions and renovations over the intervening years. As yet the dates of these alterations are unknown to this author.
An extension has been added to the west end of the original building. The extension ‘wraps’ around the south and north sides. The extension has mostly a timber floor system with a concrete floor to the south side. The roof is partly flat and partly pitched. The pitched section is an

extension from the original building roof line. The flat roof section is approximately 3.0 metres wide on the south, west and north sides. At the south this extension has an office, a entry foyer and a baby sleeping room. At the east is a child-minding area and at the north are toilets and a kitchen.

Extensions to the building were also added at the east end on the south, east and north sides. The roof mimics the west end with flat roof on the outer sections of the extension.
At the east the extension houses toilets to the north and east, a storeroom to the north and a storeroom and a second kitchen to the south with a covered porch area between the kitchen and the foyer. The hall entry doors are located under the porch.
The floor of the extensions to the south and east toilet areas are concrete and the remainder are timber floor systems.
The east extension walls are generally masonry with the remainder of the extension's walls cement sheet weatherboard cladding.
The evidence indicates that the floor in the area of the hall, but excluding the stage area, has been provided with new flooring boards. Re-stumping appears to have been undertaken at some stage of the building's history. This is deduced because the stumps are concrete, whereas the original stumps would more than likely have been timber.
It was noted that some packing of some stumps has been undertaken, most likely post installation.

The structure is located at the north east of a larger reserve. The general fall of the land is from south to north. A gravel carpark is located to the south of the building and the carpark surface walls towards the building with no surface drainage provided.
On the south side between the carpark and the building concrete paving has been provided with a minor fall away from the building. The paving finished surface level is equal to the building floor level. Some recent modifications have been made to the concrete paving to create a shallow spoon drain south of the hall entry doors.
At the east concrete paving exists and falls away from the building. At the south east corner of the building is a garden bed that has poor surface drainage with parts falling towards the building.
At the west, a child outdoor play area has been created and the surface is covered in a synthetic grass. It is unknown if the synthetic grass is laid over concrete or soil. The surface has been raised to within approximately 200mm of the floor surface level.
The north side is all grass with a general fall away from the building. Between the north kitchen and north storeroom, the soil surface has been raised to approximately the bearer level.
Although the grass area to the north of the building falls away from the building, the area is poorly drained and areas of soft soil were evident.
A septic system exists northeast of the building. The septic has a pump system to maintain the levels in the underground tanks. The distribution field area is not known. It has been reported that this system has had multiple failures in the past with resulting overflowing to the soil surface of the tanks.
A pit is located directly north of the north storeroom. The purpose of the pit in unknown, but it has been fitted with a pump to keep the pit empty of water. It is unknown if the pit is for rainwater or if part of the septic system.

A line of significant trees are located along the north boundary on the neighbour's property. Other significant trees are located near to the southeast corner of the building.

5.0 CONDITION ASSESSMENT;
The following is a list of building issues noted during the inspection. Some may be considered as building defects while others are issues that may contribute to existing or future building distress.

Given that the inspection was a visual non-destructive inspection and not a dilapidation report, this list should not be considered as exhaustive as removal of items such as carpet or wall hangings may reveal additional issues.

Generally, and damage that appears to be solely due to vandalism will not be included in the report.

Assessment Item	Description	Comment	Issue	Photo
1	Concrete paving levels, south side	The concrete paving on the south side of the building opposite the hall entry doors falls towards the building at the east and centre of the porch. The fall is away from the building near the hall entry doors. This will have caused ponding in front of the doors and water entry under the floor at the south west corner of the south kitchen. The concrete has had ad-hoc works undertaken to form a shallow spoon drain.	Spoon drain may cause minor safety issue – (twisting of ankle) Water entry under the building will result in possible footing movement.	2
2	Gravel carpark level and fall	Gravel falls towards the building. No drainage provided.	The minimal falls in the south apron paving will allow water flowing from the carpark to enter under the building in high rain events.	
3	Lack of ventilation under building.	The sub-floor ventilation is nil on the south and east sides. It is minimal on the west side.	Lack of ventilation may cause "dry rot" of sub-floor frame members. High moisture levels in the soil will contribute to footing movement.	

Assessment Item	Description	Comment	Issue	Photo
4	Raised garden bed at south east corner. Overflowing roof gutter in south east corner. South kitchen door gaps	The garden bed "traps" water next to building due to lack of drainage / falls away from building. Water overflowing from the gutter will add the localised moisture levels in the soil. The overflow is due to lack of fall in gutter and lack of downpipes.	Water ponding near buildings cause high localised moisture levels and result in footing movement. The soil will heave if clay and moisture level raises compared to other locations. The building will settle if the moisture level in the soil is high and the soil loses bearing capacity. The levels taken during the inspection shows that the floor along the south kitchen south wall are low relative to the building re-entrant corner. The area below the metre box is relatively high.	
5	Gutter to east side of building.	The gutter from the southeast re-entrant corner and along the east side has only one downpipe, located at the northeast corner of the building.	The number of downpipes is less than recommended for this length of gutter. Overflowing at the southeast re-entrant corner is evidenced by green algal growth on the wall of the building, particularly near the ground.	3, 4
6	Modifications to sewer drains.	The concrete paving to the east of the building has had a section removed and relaid.	The reason for this modification is unknown. If due to a pipe leak, then this may have effected the footings in the past.	
7	Northeast corner underpinning.	The concrete slab for the toilets at the northeast of the building has had underpinning works undertaken post 2016.	The footings of the slab were found to have subsided and underpinning was recommended. See report by Andrew Cherubin & Associates number 16-142 SIR01	

Assessment Item	Description	Comment	Issue	Photo
8	East entry door large gaps and distorted.	The entry door on the east side of the building has large gaps and is significantly distorted.	It appears that this door may have been vandalised in the past. The gaps are assumed to be partly due to footing movement and partly due to vandalism.	
9	External crack in render – north east corner	This crack was present when the inspection for the 2016 report was undertaken	See item 7 above.	
10	Disused septic waste pipe north side east end.	This pipe is an indication that the septic system and associated pipework has been modified in the past.		
11	Reported septic tank pump failures.	The reported failure of the septic tank pumps are accompanied with tank overflow to the surface.	Any failure of the septic system that leads to leakages or overflows will increase the soil moisture levels for a short time. If the occurrence is during wet periods, then soil saturation and consequent loss of soil capacity may occur.	
12	Surface water ponding.	There are indications that water is permitted to pond near the building on the north side. This is more noticeable at the east of the building.	Water ponding can be a significant cause of footing movement.	5
13	Overflow outlets in roof gutter – north side	The need for overflow outlets indicate the downpipe system is not functioning effectively	Excessive overflow from the gutters will be adding additional water to the soil surface near the footings during rain events. The downpipes are a sealed system to the rainwater tanks. The need for the overflows indicate that the downpipes are not effective, which may be due to the height of the rainwater tank in relation to the gutter.	6

Assessment Item	Description	Comment	Issue	Photo
14	High soil surface level in north courtyard.	The soil surface in the north side courtyard has been built up to approximately the level of the underside of the floor bearer.	There has been no provision for water drainage from under the building and it appears that at times rain surface water flows under the building.	7
15	North side plinth boards and sub-floor access door.	Very poor condition		
16	Scoria fill hole	A hole below the gas HWS on the north side of the building has been filled with scoria. The purpose of the hole mis unknown.	The hole depth is unknown. The hole will fill with water during rain events and introduce the water into the soil profile. This may lower the local soil capacity or create soil heave, depending on the amount of water held and how long before dispersion.	8
17	North kitchen – indications of floor / footing movement	The walls of the north kitchen are of cement sheet with flexible joints between sheets. This will limit the degree of cracking. Wall cracks are evident on the east side of the kitchen and the external door has uneven gapping.	The	
18	North kitchen roof leaks	Drip marks on east wall indicate current or past roof leaking.	It appears that this leaking may be due to poor roofing or roof flashing installation.	
19	North Kitchen roof beam settlement	The wall cracking and east side door gapping and floor levels indicate that settlement has occurred under the stump supporting the kitchen's roof beam at the east end.		

Assessment Item	Description	Comment	Issue	Photo
20	Southeast storeroom. Roof leak and wall cracking.	In the northeast corner of the storeroom there is moderate wall cracking. The ceiling has mould at the southeast of the room.	These defects appear to be a result of floor movement and from leaking roofing. The floor movement is noted in items 4 and 5 above. The roofing is poorly installed in this area allowing for intermittent rainwater entry. The corrugation on the upper portion before the barge flashing directs water under the flashing with the possibility of water 'spilling' onto the internal plasterboard.	
21	Floor ground clearance	The floor ground clearance at the south side of the hall has very minimal ground clearance.	Along with the poor ventilation of the sub-floor, the minimal ground clearance may result in dry rot or similar timber deterioration or in high soil moisture levels for extended periods.	
22	East wall, north end; Gapping between post and wall	A steel post installed as part of the hall's previous north extension has a gap between the post and the east wall.	This gapping appears to be associated with the slab footing movement of the east toilet slab.	
23	Southeast toilets (male) roof water leak	Water marks were noted on the south wall of the east toilet room.	These leaks are due to the overflowing of the gutter on the south side of the building mentioned previously.	
24	Roof leak over south side of stage	The timber ceiling lining has indications of a roof leak. It appears that this leak is minor or intermittent.	Long term leaking of roofing may cause deterioration of frame members and wall cladding.	
25	Stair passage at rear of stage has ad hoc repair to cornice.	The cause of the need for the cornice repair is unknown, but does not appear to be of significant structural concern.		

Assessment Item	Description	Comment	Issue	Photo
26	Significant indentations to roof sheeting - north side	The lower parts of the roof sheeting of the 30 degree portion of the roof have significant deformations, apparently due to persons trafficking the roof.	The inspection has revealed that there is no roof batten for approximately the last 600mm of the steeper roof sheets. These roof sheets sit onto the lower pitch roof sheets at the ends. Therefore the upper roof sheets are effectively unsupported for the lower 600mm. Any loading to the sheets has resulted in deformations. This could lead to water leaks, particularly by wind driven rain.	
27	Dip in alignment of roof sheets	Investigations indicate that the new trusses provided for the pitched roof west of the stage area were installed with a lower pitch than the original roof line. On the south side, the roof battens were locally raised to provide a appearance of a straight roof alignment. On the north, this lifting of the battens was not undertaken and s dip in the roofing is noticeable.	Possible roof leaking may result from poorly 'seating' roof sheets. Tie downs may not have been installed correctly.	
28	Poorly installed roof flashing on south side at change of roof pitch.	The flashing installed at the change of roof from 30 to 10 degree is buckling in places.	May allow wind blown rain to enter.	
29	Deflection in south verandah roof	The roof over the south verandah has a noticeable deflection downwards. It is possible the rafters were undersized when installed.	Not apparent issues at present.	

Assessment Item	Description	Comment	Issue	Photo
30	No tension release on roof sheets.	Low pitched roof sheets are normally provided with a drip release method to prevent water backflowing on underside of sheeting.	Possible result of no drip release is that water may backflow on underside of sheets and drip into internal of building.	
31	Corroded roof sheet	The roof sheet and flashing below the aerial at the east end of the roof is corroded. This appears to be due to bird droppings.	Roof sheet and flashing will need replacement earlier than remainder of roof.	
32	Silicone on roof sheet joins.	It was noted that some roof sheet lap joints had silicone along the joints. This was possibly due to detected leaks.	The effectiveness of the silicone on such joints is limited due to sheet expansion and contraction breaking the seal.	
33	Pit on north side of building.	The purpose of this pit is unknown. It has a pump installed for removal of water.		
34	Floor levels.	Floor levels taken within the hall during the inspection indicate that the floor has a variation of up to 63mm. The floor is generally high at the south and low at the north. No floor levels were taken in the child minding areas or associated office and foyer.	The floor levels indicate that footing settlement and possible soil heave have occurred resulting in wall cladding cracking, windows and doors sticking or gapping and other issues associated with floor footing movement.	
35	Truss modifications	The original roof appear to have had some truss modification at the stage end of the hall. These modifications are by way of removal of "webs". It could not be confirmed if the trusses were built different to the remainder or if modified.	The modifications, if confirmed as modifications, do not appear to currently be having a detrimental effect on the structure.	

The soils for this site are expected to be complex when moisture levels and soil heave and shrinkage are considered. The upper layer is a sandy clay to clayey sand, whilst the lower layer is clay. This results in the upper soils possibly becoming saturated in wet weather.
If the upper soils become moist, any clay will tend to develop a heaving profile, however if the soil is very sandy or if the clay becomes overly saturated, the soil will lose its bearing capacity. Heaving soils may result in floors heaving upwards, whereas loss of soil capacity would result in settlement. The clays below the upper layer will form an impermeable barrier, holding moisture in the upper layer.
The trees around the building are likely to cause the lower clay soils to shrink during dry periods. This shrinkage would further cause the building to settle.

6.0 DISCUSSION AND RECOMMENDATIONS;

The following discussions and recommendations are intended to address the requested scope of the inspection.

Stability and expected remaining useable life of the structure

It is my opinion that the building at a structure is stable and suitable for continued use.
The floor in the hall area has a fall of approximately 55mm from high near the hall entry doors at the south to a low at the southeast corner. Across the hall width at the west end the fall is approximately 40mm but the southwest is approximately 15mm low relative to the south entry doors.
The building can therefore be considered to have a "tilt" from high at the south to low at the north. Although the inspection was not definitive, it appears that the most likely cause of this deviation from level is due to the type of founding soils and the depth of footings and due to the trees lining the north boundary.
The trees will extract moisture from the clay soils during dry periods which will result in footing settlement.
The founding soils are subject to saturation during wet periods and if fully saturated, the soils will lose bearing capacity resulting in footing settlement.
A soil investigation was not undertaken as part of this inspection, however underpinning works were undertaken on the footings of the northeast toilet extension and in April 2017, the excavations were inspected by myself and the profile was noted as follows;

Surface to 900 deep – Silty sandy clays or sandy clays.
Below 900 deep – Clays

The upper soils are very sandy and with the clays below are likely subject to saturation, particularly near the depth of the clay layer which is relatively impermeable.
The depth of stump pads was not determined during the inspection, however it is likely that they were founded into the upper soil layers and possibly close to the clay layer, a layer with lowered bearing capacity during wet periods.

Building Structure – general;

Given the issues causing footing settlement, the building is expected to continue to have movement issues, however with ongoing maintenance, replacement of claddings as necessary and if the recommendations below are implemented, the building is expected to be usable for a significant time into the future.

The absolute cause of the building settlement has not been fully determined at this stage, however it is this author's opinion that the significant trees along the north boundary and to a lesser extent at the south east corner, have caused the underlaying clays to shrink. This settlement has possibly been exaggerated by the saturation of the upper sandy clays during wet periods causing loss of bearing capacity and the resulting footing settlement.

The floor slab for the south east toilets has settled at the south and east relative to the original floor level. This has resulted in the toilet addition "pulling away" from the main building structure at the top, noted by gaps in wall claddings both internal (east wall gap at east beam post and masonry gaps to weatherboards on north face at east end).

Wall claddings

Some of the timber weatherboard wall claddings are expected to require replacement in the near future.
The cement based wall claddings (Hardieplank) are expected to have a very long lifespan.
The internal claddings are a mix of plaster, masonry and timber lining boards. These are all generally in good order and only minor repairs are required.
The plinth boards around the base of the north side are in poor condition and replacement should be considered.

Roof Trusses

There is possibility that the roof trusses over the stage area may have modified at some time in the past. Deflection of the roof over this area is apparent and where the remainder of the trusses have webs, these trusses do not have any webs.
Further investigation is recommended.

Roof Sheeting

The roof sheeting will require some rectification work to prevent the recent leaking and a corroded flashing at the east end needs to be addressed.
The north side 30 degree pitch roof sheets are improperly supported at their lower end. This can be rectified by installing a timber batten either in the short term or if access is limited, then the batten can be installed when the roof sheets are replaced.
The sheet joints that have silicone sealants will require modifications.
Given the apparent condition of the sheets, their lifespan is expected to be in the order of 5 to 10 years. This will be dependant on the prevailing weather conditions.

Any identified issues

The issues noted during the inspection have been listed in the condition assessment above.

Recommendations of potential future solutions to be investigated

Prior to allocating significant funds, it is recommended that a monitoring regime be implemented to confirm the assessment in this report relating to the building movement.
The following particularly should be determined.

- Is the upper soil becoming saturated during wet periods.
- Is water being permitted to pond near the footings.
- Has the stumps been founded at a suitable depth.

The following recommendations are for future monitoring or verification purposes;

- It is recommended that a detailed floor level survey be undertaken and recorded. This will aid in future assessments to determine the extent of any continued building movement.
- Investigate the depth of stumps to establish if founded into stiff clay or into sandy clay.

- Undertake geotechnical investigations during wet periods and dry periods to determine the soil characteristics.

The following recommendation are to rectify issues or maintain the building in good condition. Some of the recommendations are necessary irrespective of the outcomes of the footing monitoring, while others are dependant on the monitoring outcomes. If an item is recommended irrespective of the monitoring outcome, an "R" has been added to recommendation number.

Recommendation No.	Recommendation
1 R	Undertake landscaping works to ensure that water cannot pond near building. This will include; • Regrade north side surface to provide falls without ponding from under the building to near the north boundary. • Undertake works to ensure the area at the south east falls away from the building and has sufficient surface drainage to prevent water ponding near footings. • Provide a catch drain system between carpark and building. This may require sub-surface and surface drainage. • Reassess the south paving and ensure water flows away from building and is discharged away from building. • Remove the soil in the north courtyard and regrade to allow any water from under the building to flow away from the building and prevent water entering under the building. Andrew Cherubin and Associates P/L can provide a fee for a drainage plan on request.
2	If the monitoring indicates that clay settlement due to clay shrinkage is causing movement, then the installation of a root barrier between the trees to the south and the building may alleviate this issue at the south east. It is NOT recommended to install a tree root barrier at the north unless it has been determined that the upper soils are not becoming saturated. If they are saturated at wet times, then sub-surface drainage should also be provided a the same time as any root barrier.
3 R	Determine the location of the septic dispersion field and if within an influence zone of the building, it is recommended to move the dispersion area.
4 R	Undertake further investigations to determine the purpose of the pit located north of the north storeroom. Investigate if any leakage from the pit is occurring and repair as necessary. Investigate the discharge location of the pit pump and modify if possibility of causing soil saturation near the footings. If the pit is found to be redundant, it is recommended it is decommissioned by filling with concrete or removed and the hole filled with a compacted 5% cement stabilised clay soil.

Recommendation No.	Recommendation
5 R	Review all the gutters and downpipes. Ensure all gutters have appropriate falls. Install additional downpipes as necessary (South east corner of building requires a downpipe to prevent overflowing). Remove the gutter overflows to the north storeroom gutter and modify downpipes to ensure proper flows to prevent overflows to ground. Alternatively, connect overflows outlets to a new pipe system and discharge away from building to prevent saturating the soil near the building.
6 R	Investigate the scoria filled hole below the HWS on the north side of the building. If not purpose is apparent, remove the scoria and replace with compacted 5% cement stabilised clay soils.
7 R	Review the roof flashings. Replace corroded sections. Modify the flashings at the south east corner of the building and the east side of the north kitchen. Review the roof sheet silicone joints and modify the roof sheets or flashings as necessary. It appears that the water may be entering above the joint, not into the joint. If proven into the joint, then replace roof sheets immediately each side of joint so a greater lap of sheets is provided.
8 R	Check the sub-floor timber for dry rot or other forms of decay. Replace timbers as necessary.
9 R	Provide sub-floor ventilation, particularly at the south end. Seek further advice from engineers on methods of ventilating the sub-floor area.
10 R	There are indications that the north kitchen roof beam has support settlement at the east end. This does not appear to be a frame defect, but rather appears to be settlement of the supporting stumps under the beam. If the above reasons for settlement are confirmed, then replacement of this stump may be required.
11 R	The east entry door has significant gapping and deformations. It appears that this door has been vandalised for possible forced entry. The door should be replaced. Unless the door needs to open outwards for emergency egress purposes, it is recommended that the door and frame be replaced with a door that opens inwards and that a security door installed on the outer side. Three hinges will help to prevent buckling of the door.
12 R	Investigate if the trusses over the stage have been modified. If yes, the rectification is recommended. If no indication of original truss modifications, then monitoring or roof and ceiling deflection is recommended.

Remediation recommendations to make safe if required.
The building structure can be considered as generally safe for continued use. No immediate remediation is required for overall structural safety.

For localised safety concerns, the access stairs at to the north kitchen and to the north store should be reviewed and replaced as necessary.

The stage access stairs are not fixed to the building and were not included in the report. Nor was the electrical or plumbing. These do not form part of the report and should be inspected separately if deemed necessary.
Provided continued maintenance is undertaken, the minor safety issues, such as strain from exerting against a sticking door, can be avoided.
Re-assessments should be undertaken when major building elements are replaced or modified, such as checking roof batten tie downs when roof sheets are replaced.

End of Report
Andrew Cherubin & Associates P/L

Andrew Cherubin BEng (Hons) MIEAust
Chief Executive Director
RBP No; EC 23451
RPEQ No. 19888

Appendix A

Photos

Photo 1; Nearmaps aerial view of site.

Photo 2; South of hall. Arrows show direction of paving fall.

Photo 3; Building south east re-entrant corner.

Photo 4; South east re-entrant corner. Algal growth indicating high moisture levels.

Photo 5; Septic tank location, within bollards. Uneven soil surface allowing for water ponding.

Photo 6; North gutter showing overflow outlets.

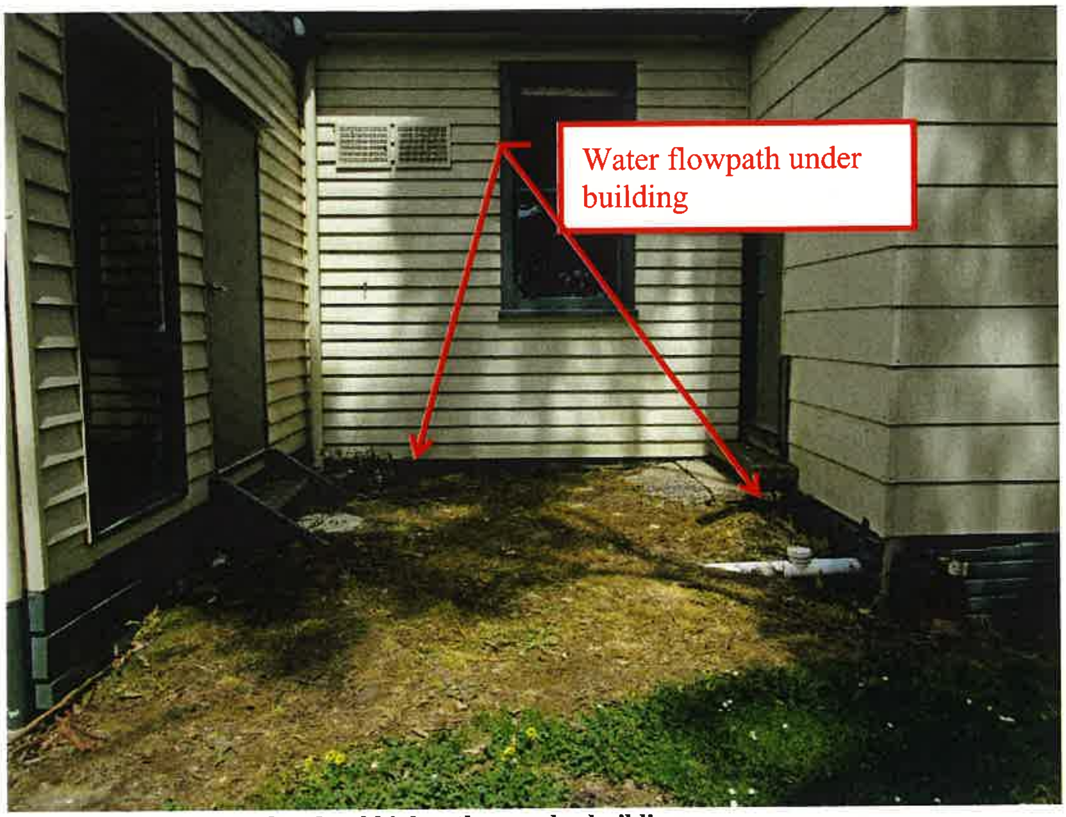


Photo 7; North courtyard; soil surface level higher than under building.

Photo 8; North side. Scoria filled hole. Purpose unknown.

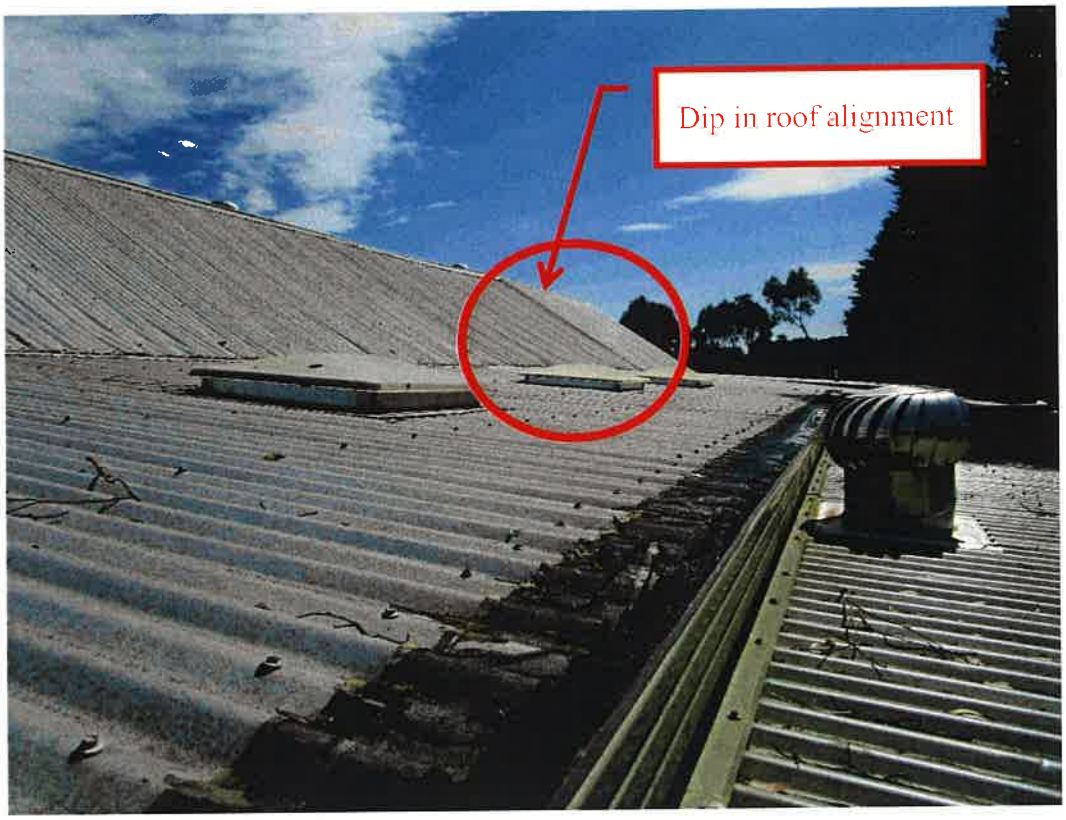


Photo 9; North side of roof

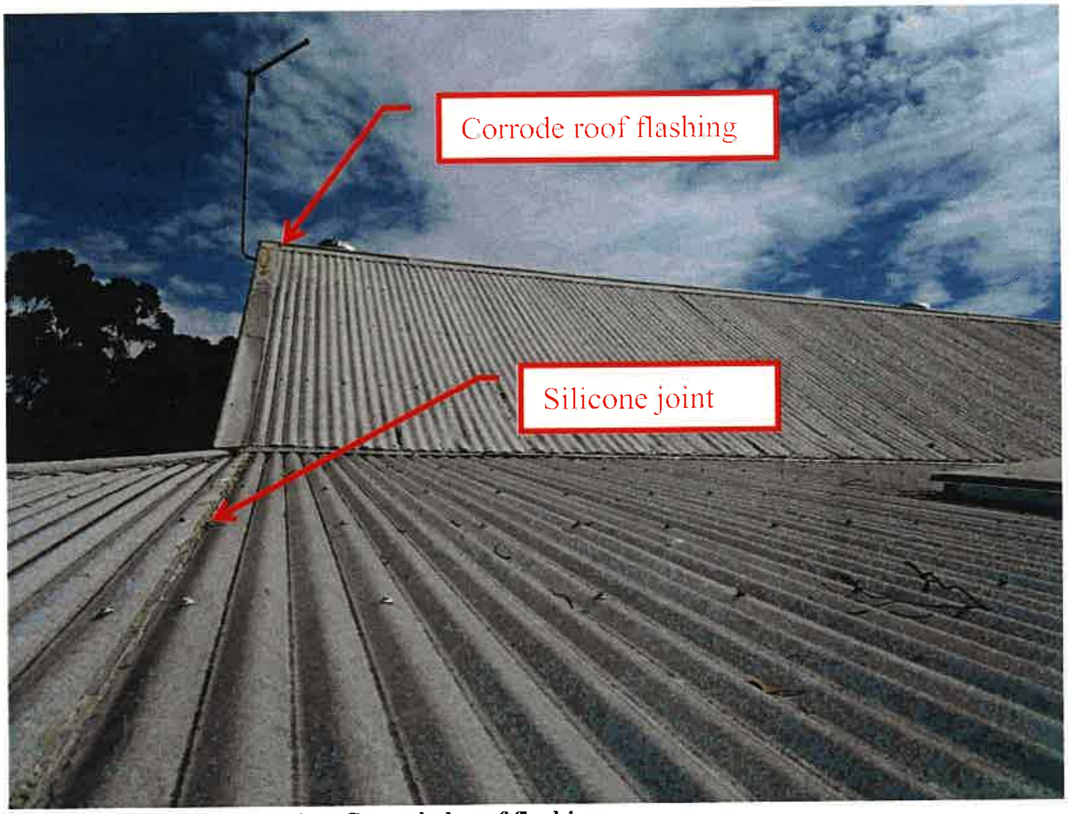


Photo 10; North side roof. Silicane joint. Corroded roof flashing.

Photo 11; Example of poorly installed flashing. Missing roof screw and no pop rivits to hold sections together. Flashing not wide enough to extend to next corrugation fully. Screw at top not into top of corrugation.

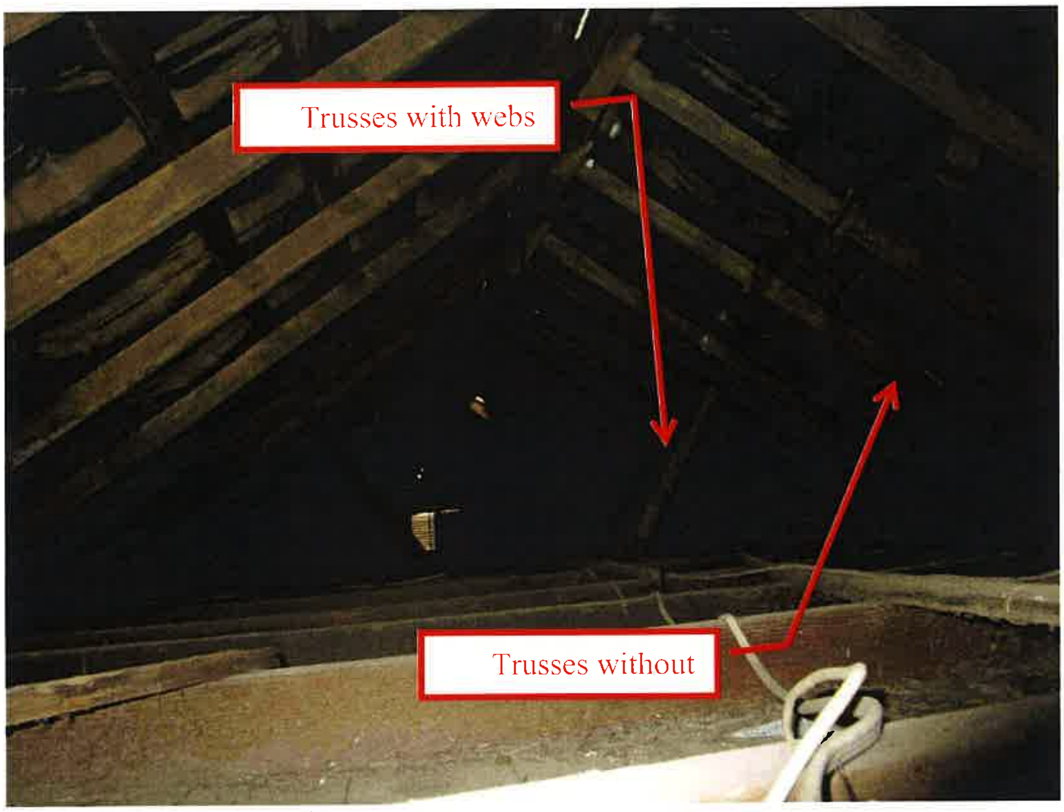


Photo 12; Original roof structure looking to east.

Appendix B

The Purpose of the Inspection and Report

1. This report is a response to the client's stated purpose for the inspection and scope.
2. To identify a list of issues for information or for discussion, action and resolution.
3. Inform the client of any fault or condition that otherwise can be determined by a visual inspection but may not be apparent to persons with no technical or building knowledge.

Inspection Limitations and Report Disclaimer

This report is not an **Expert Witness VCAT Report** and as such it does not have all the additional details, references and declarations that are required from an expert witness VCAT report (a VCAT report requires more time and research to prepare and it is therefore not within the limited scope).

Advice Limitations: This report does not contain legal advice. For legal advice contact a lawyer. Anything pertaining to legal aspects are for discussion only.

Safe Access Limitations: The Inspector's decision about safe access to any area on the day of inspection is final.
Property inspection can be extremely dangerous due to: work in progress, presence of chemicals (pesticides), asbestos dust, unsafe access, confined spaces, rick of falling, dilapidation of buildings and other hazards. Due to OH & S requirements to provide safe working environment for the inspection the policy of Andrew Cherubin and Associates is to inspect only safely accessible areas as defined in AS 4349.1. Where an inspection of unsafe areas is required, and the risk to the inspector is assessed and deemed to be controllable by special precautions, then an additional separate special inspection booking is required. (eg: access to high roof can be achieved with scissor lift or cherry picker). Re -inspection of inaccessible/ unsafe area requires an additional booking and will attract additional fees.

Visual Inspection Limitations: This report is limited to visual inspection of the property (unless otherwise stated and no measurements or testing were carried out which are considered outside the limits of the report). This report addresses issues that are visible or may be reasonably deduced or inferred from the visual inspection and the inspector kept to safe areas and unobstructed access was possible at the time of inspection. The inspection is non-invasive (unless otherwise stated). The inspection policy and procedure is not to move furniture, stored materials etc and there is no interference with personal items.

Residual Risk of Undetected Defects:
There is no expressed or implied guarantee that there are no defects in the property that were not mentioned in the report. Defects that cannot be reasonably discovered by visual inspection such as when: inspection is obstructed, defects are concealed by renovations, are deliberately concealed or are concealed by nature of construction, may not be listed in the report. The client should clearly understand that because of inspection limitations significant residual risks of undetected defects remain. The clients should always consider additional follow up inspection or invasive inspection (at additional cost) to access areas that previously could not have been accessed. Typical examples of special additional inspections are; re inspection of property when vacant, re inspection when obstructions are removed, re inspection when inaccessible areas are opened up by additional manholes, invasive termite damage inspection when wall lining is removed to assess damage.

This is not a termite inspection report.
Assumptions:
It is assumed that the structures were constructed from a set of detailed drawings that had been assessed by an engineer or other competent person and that the construction was in accordance with those drawings. Eg; that footings were designed for the loads expected.

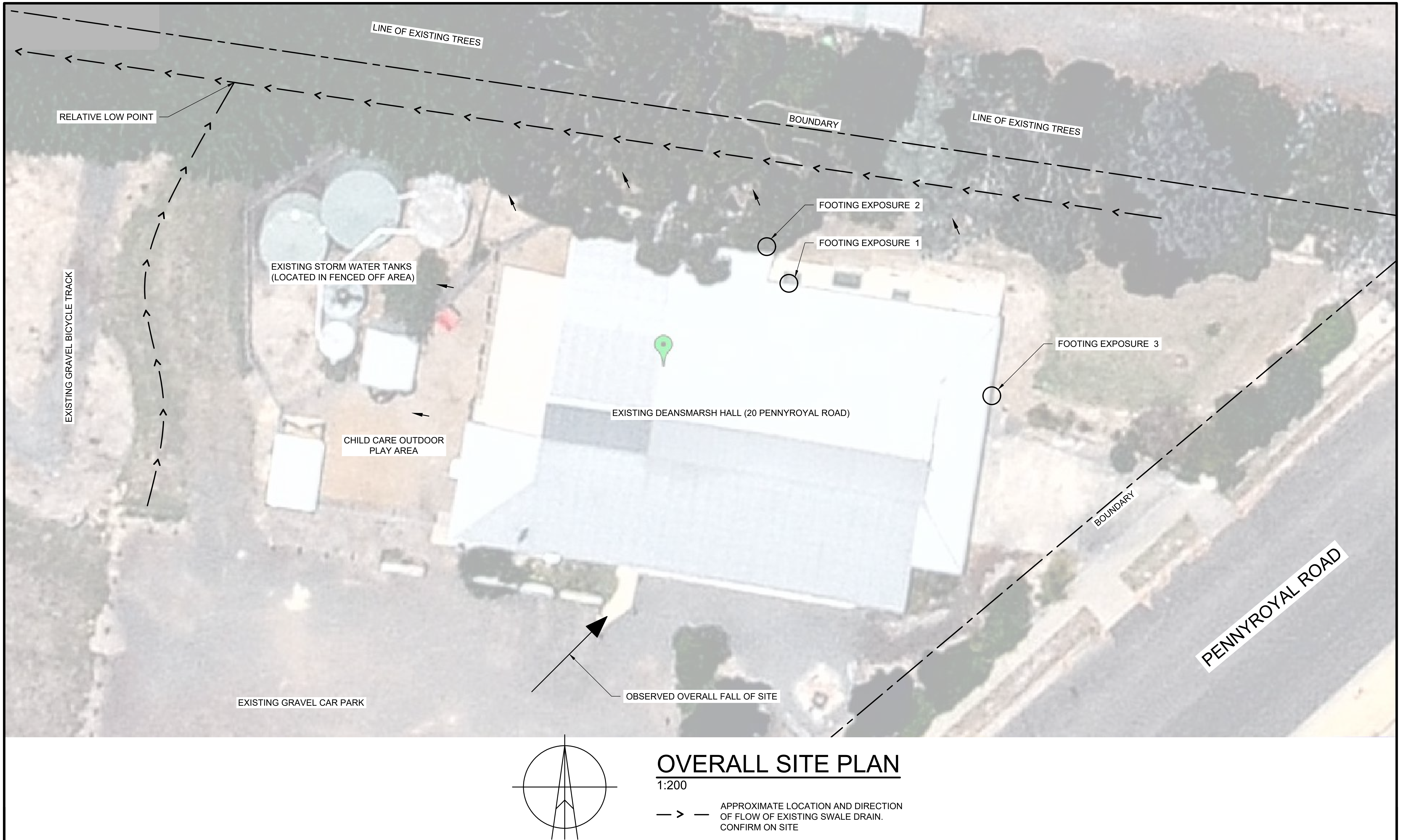
Note: All findings and comments in this report are subject to veracity of information supplied by the clients and their agents. The report proceeds on the basis that the clients and their agents act in good faith.

REFERENCES;

AS1684 Residential Timber Framed Construction
AS1720 Timber Structures – Design Methods
AS1720 Timber Structures – Timber properties
AS2870 Residential Slabs and Footings
NCC - Building Code of Australia.

APPENDIX B
Yttrup Investigation Drawings

- 23688_F01 - F11



OVERALL SITE PLAN

1:200

— > — APPROXIMATE LOCATION AND DIRECTION OF FLOW OF EXISTING SWALE DRAIN. CONFIRM ON SITE

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT: DEANS MARSH COMMUNITY HALL, 20 PENNYROYAL VALLEY RD, DEANS MARSH

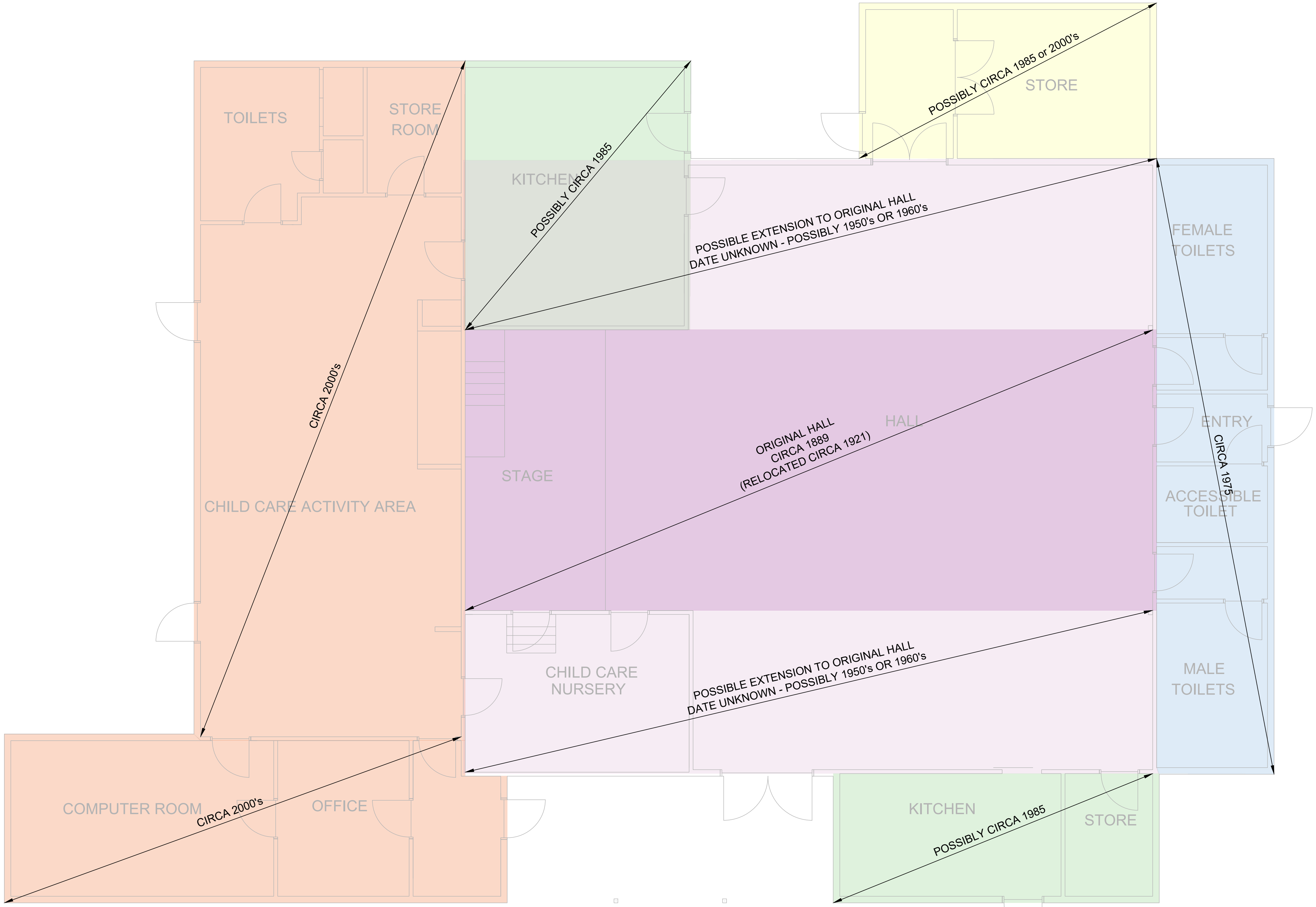
CLIENT: SURF COAST SHIRE

DRAWING TITLE: OVERALL SITE PLAN

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:200

STATUS: INFORMATION — NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F01 of 11	X1



HISTORICAL BUILDING STAGES LAYOUT PLAN

1:100

DO NOT SCALE FROM THESE DRAWINGS, ALL DIMENSIONS ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE.

HISTORICAL BUILDING STAGES & DATES ARE ASSUMED ONLY BASED ON LIMITED INFORMATION AT TIME OF WRITING AND SHOULD BE VERIFIED INDEPENDENTLY.

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD, DEANS MARSH

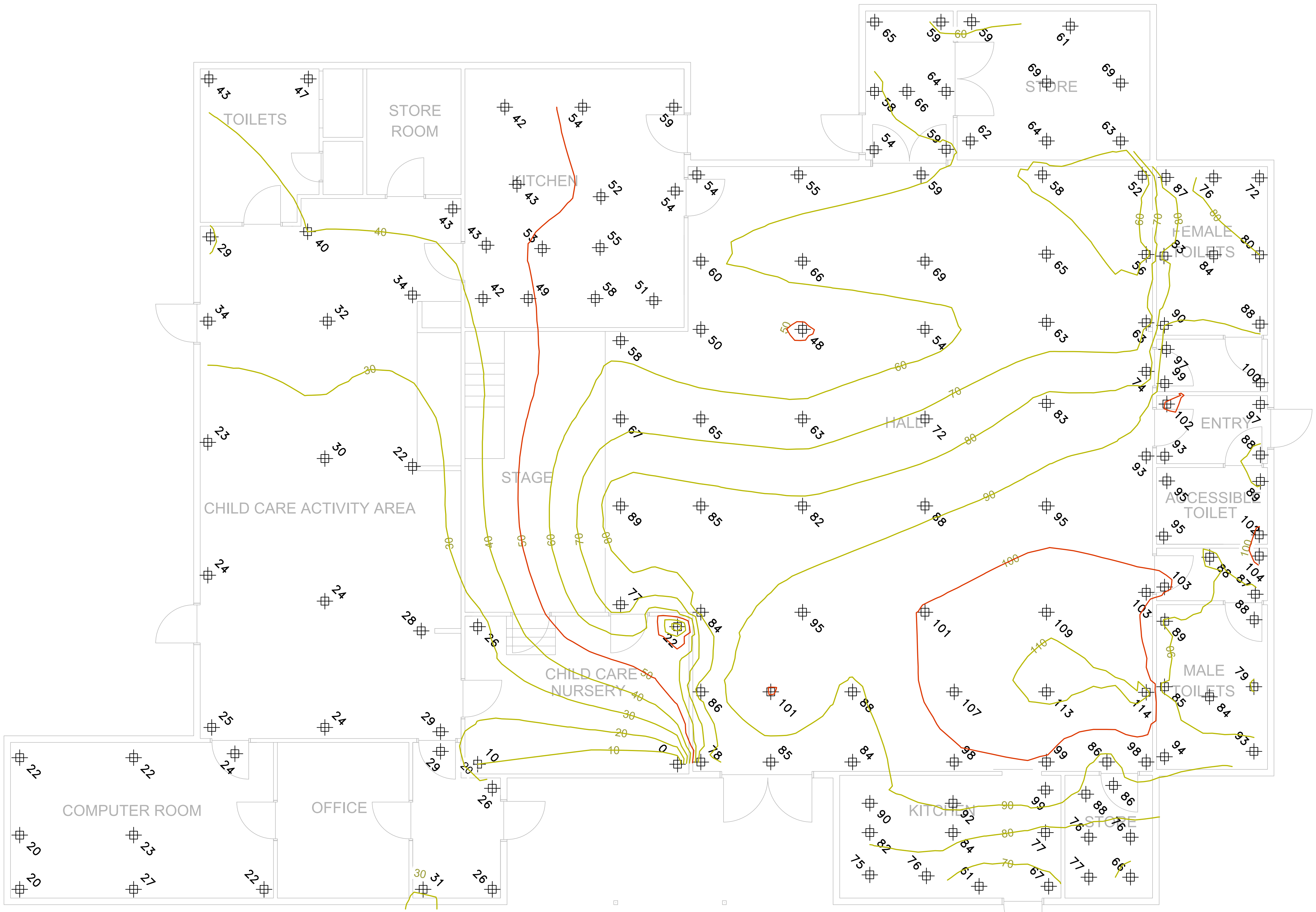
CLIENT
SURF COAST SHIRE

DRAWING TITLE
HISTORICAL BUILDING STAGES LAYOUT PLAN

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F02 of 11	X1



INTERNAL FLOOR RELATIVE LEVELS & CONTOURS

1:100

DO NOT SCALE FROM THESE DRAWINGS, ALL DIMENSIONS ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE.

7 RELATIVE LEVEL, IN MILLIMETERS

FLOOR LEVELS HAVE BEEN ADJUSTED FOR THE VARIOUS FLOOR COVERINGS & BUILDING STEPS

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP &
ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

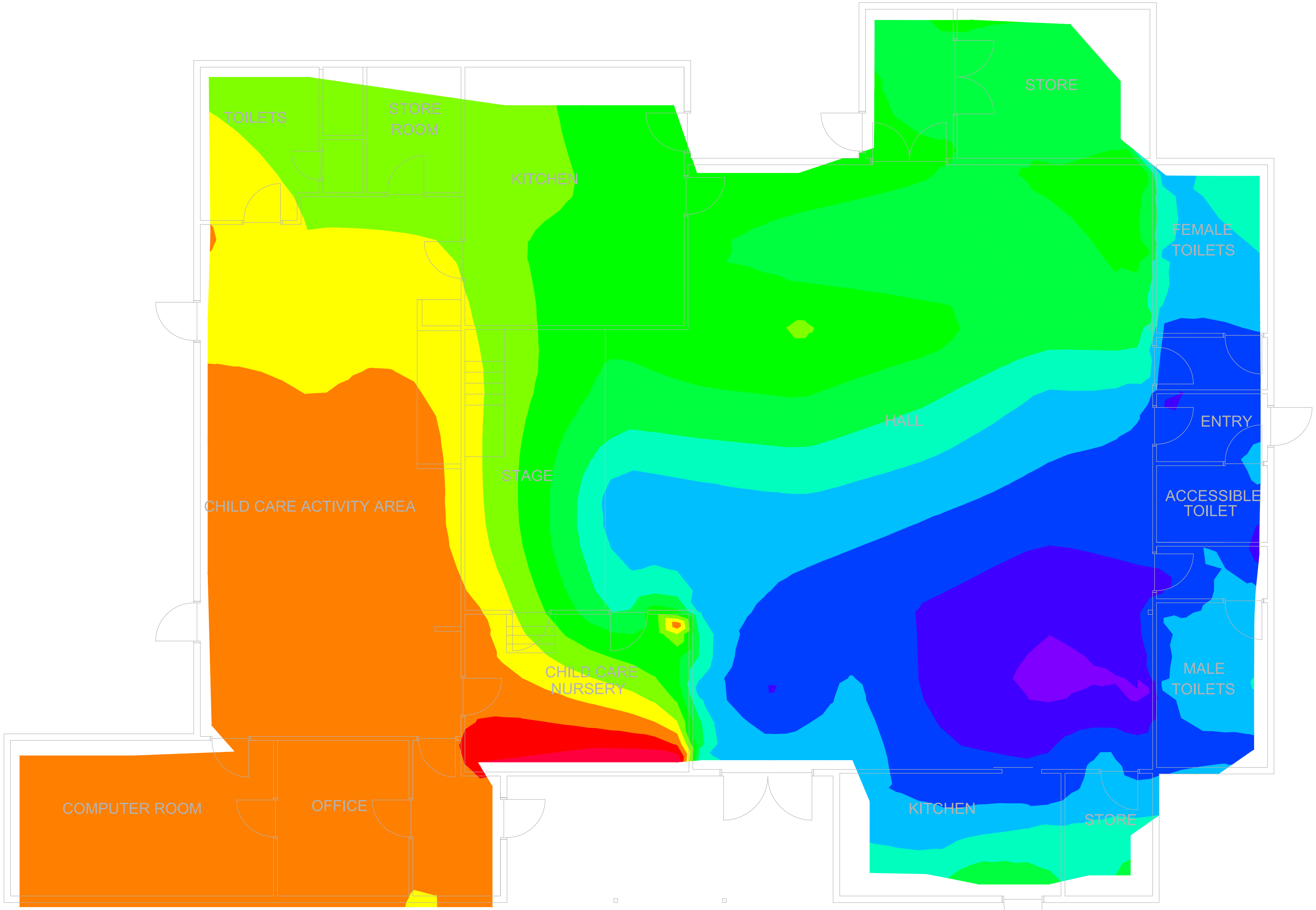
CLIENT
SURF COAST SHIRE

DRAWING TITLE
INTERNAL FLOOR RELATIVE CONTOURS

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F03 of 11	X1



Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (mm)	Maximum Elevation (mm)
1		0	10
2		10	20
3		20	30
4		30	40
5		40	50
6		50	60
7		60	70
8		70	80
9		80	90
10		90	100
11		100	110
12		110	120

INTERNAL FLOOR RELATIVE SURFACE LEVELS

1:100

DO NOT SCALE FROM THESE DRAWINGS, ALL DIMENSIONS ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE. FLOOR LEVELS HAVE BEEN ADJUSTED FOR THE VARIOUS FLOOR COVERINGS & BUILDING STEPS

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

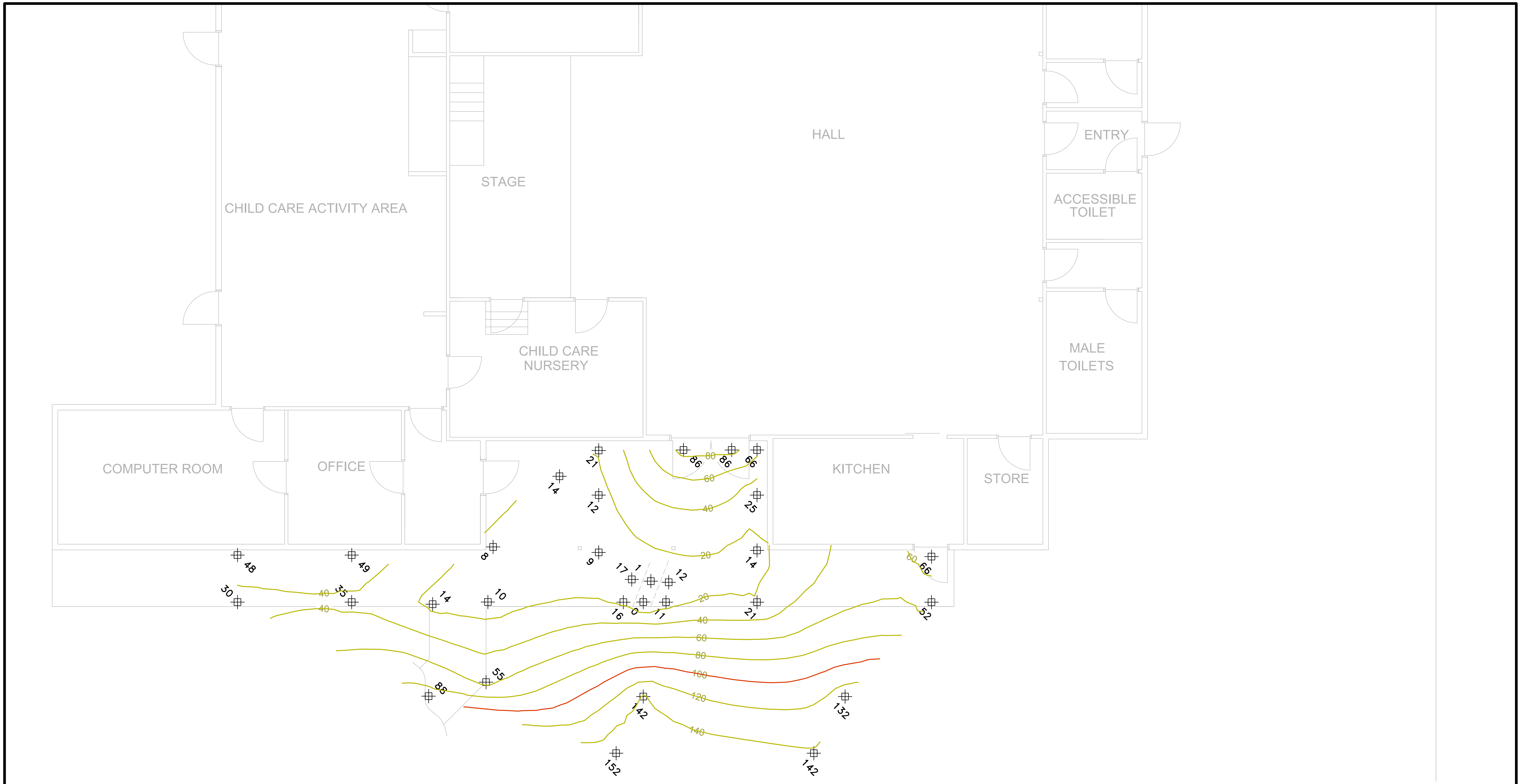
CLIENT
SURF COAST SHIRE

DRAWING TITLE
INTERNAL FLOOR RELATIVE SURFACE LEVELS ANALYSIS

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F04 of 11	X1



ENTRY EXTERNAL RELATIVE LEVELS & CONTOURS

1:100

DO NOT SCALE FROM THESE DRAWINGS, ALL DIMENSIONS ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE.

7 RELATIVE LEVEL, IN MILLIMETERS

EXTERNAL SURFACE LEVELS ARE NOT RELATIVE INTERNAL FLOOR LEVELS.

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

CLIENT
SURF COAST SHIRE

DRAWING TITLE
ENTRY EXTERNAL RELATIVE CONTOURS

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

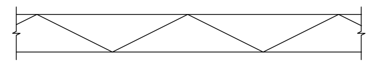
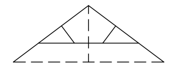
PROJECT No.	DRG No.	REV
23688	F05 of 11	X1

EXISTING FLOOR MEMBER SCHEDULE

MARK	DESCRIPTION	SIZE	REMARKS
FB1	FLOOR BEAM	90x70 (UNKNOWN GRADE)	APPROX. 1200 SPAN (CONTINUOUS) APPROX. 1100 cts
FB2	FLOOR BEAM	50x100 (UNKNOWN GRADE) + 45x70 (UNKNOWN GRADE)	MEMBERS ON FLAT APPROX. 1100 SPAN (CONTINUOUS)
FB3	FLOOR BEAM	90x70 (UNKNOWN GRADE)	APPROX. 1100 SPAN (CONTINUOUS) APPROX. 1100 cts
FB4	FLOOR BEAM	90x70 (UNKNOWN GRADE)	APPROX. 1500 SPAN (CONTINUOUS) APPROX. 1000 cts NO FLOOR JOISTS EVIDENT
FJ1	FLOOR JOIST	90x45 PINE (UNKNOWN GRADE)	APPROX. 1100 SPAN (CONTINUOUS) 450 cts
FJ2	FLOOR JOIST	120x50 (UNKNOWN GRADE)	APPROX. 1200 SPAN (CONTINUOUS) 400 cts
FJ3	FLOOR JOIST	110/120x45 (UNKNOWN GRADE)	APPROX. 1100 SPAN (CONTINUOUS) 450 cts
FJ4	REPLACEMENT FLOOR JOIST	120x45 PINE (UNKNOWN GRADE)	REPLACEMENT JOISTS IN LIEU OF FJ3 JOISTS IN SOME LOCATIONS APPROX. 1100 SPAN (CONTINUOUS) 450 cts

NOTES:
* ALL MEMBER LOCATIONS AND SIZES ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE.
* TIMBER PROPERTIES/GRADE UNKNOWN AT THE TIME OF THE INSPECTION.

EXISTING WALL & ROOF MEMBER SCHEDULE

MARK	DESCRIPTION	SIZE	REMARKS
CJ1	CEILING JOIST	100x45 (UNKNOWN GRADE)	HARDWOOD ASSUMED 600 cts
CJ2	CEILING JOIST	90x35 PINE (UNKNOWN GRADE)	WITH 70 x 35 x 500 LONG PINE HANGERS FROM BTM CORD OF TR2 OVER AT 3200 cts JOISTS AT 1200 cts
CJ3	CEILING JOIST	130x35 (UNKNOWN GRADE)	400 cts
R1	RAFTER	85x35 (UNKNOWN GRADE)	HARDWOOD ASSUMED 600 cts
R2	RAFTER	150x45 (UNKNOWN GRADE)	1200 cts
RB1	RIDGE BOARD	200x25 (UNKNOWN GRADE)	
RB2	ROOF BEAM	2-400x50 LVL (UNKNOWN GRADE)	
TB1	TENSION BRACE	Ø20 ROD	
TR1	STEEL ROOF TRUSS	90W x 70D x 6 THICK WELDED 'T' TOP & BTM CHORD Ø20 ROD DIAGONAL WEB MEMBERS 450 OVERALL DEPTH	
TR2	TIMBER ROOF TRUSS	R1 TOP CHORD CJ1 BTM CHORD 100x35 (UNKNOWN GRADE) DIAGONAL WEB MEMBERS	600 cts 
TR3	PREFABRICATED TIMBER ROOF TRUSS	90x35 TOP CHORD 70x32 DIAGONAL STRUTS 90x35 BTM CHORD	1200 cts 35x70 BATTENS AT 1000cts OVER
TR4	PREFABRICATED TIMBER ROOF TRUSS	CONFIRM ON SITE	
TR5	PREFABRICATED TIMBER ROOF TRUSS	CONFIRM ON SITE	2 x PARALLEL TRUSSES IN CEILING SPACE OVER STAGE CURTAIN
TR6	PREFABRICATED TIMBER ROOF TRUSS	CONFIRM ON SITE	
SR1	SAG ROD	Ø20 ROD	

NOTES:
* ALL MEMBER LOCATIONS AND SIZES ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE.
* TIMBER PROPERTIES/GRADE UNKNOWN AT THE TIME OF THE INSPECTION.

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

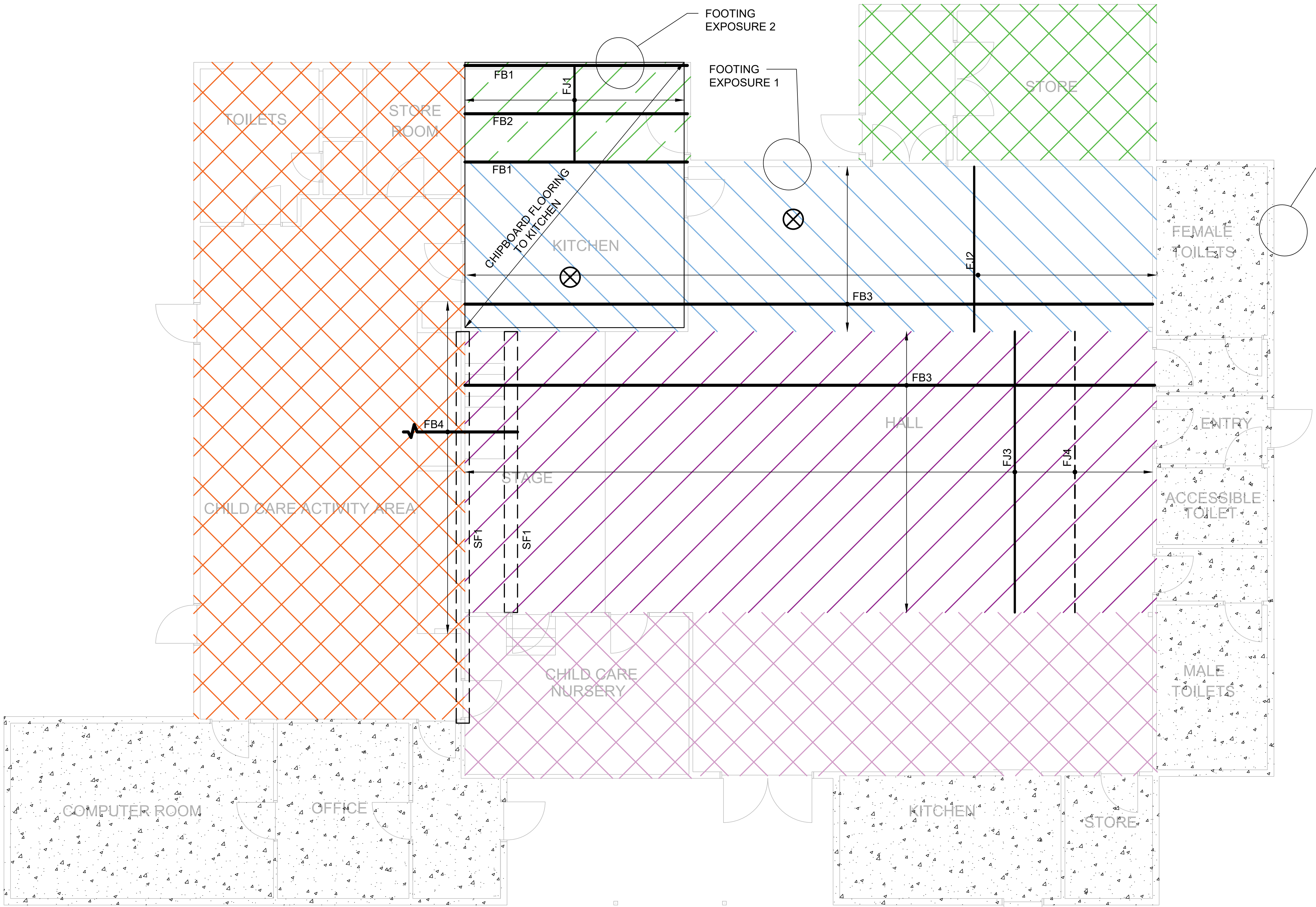
CLIENT
SURF COAST SHIRE

DRAWING TITLE
EXISTING FLOOR AND ROOF MEMBER SCHEDULES

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F06 of 11	X1



LEGEND

- 100 x 100 CONCRETE STUMPS CONFIRM ON SITE
- 125 x 125 CONCRETE STUMPS CONFIRM ON SITE
- 130 x 130 HW TIMBER STUMPS CONFIRM ON SITE
- UNKNOWN TIMBER FLOOR FRAMING AND STUMPS CONFIRM ON SITE
- UNKNOWN TIMBER FLOOR FRAMING AND STUMPS CONFIRM ON SITE
- UNKNOWN TIMBER FLOOR FRAMING AND STUMPS CONFIRM ON SITE
- CONCRETE SLAB CONFIRM ON SITE
- ⊗ APPROXIMATE LOCATION OF FAILED CONCRETE STUMP CONFIRM ON SITE
- SF1 — — — APPROXIMATE LOCATION OF EXISTING STRIP FOOTING CONFIRM ON SITE

EXISTING FOOTING & FLOOR FRAMING LAYOUT PLAN 1:100

NOTES:
1. REFER TO F06 FOR MEMBER SCHEDULE
2. ALL FLOORINGTO HALL AREA IS ASSUMED TO BE HARDWOOD TIMBER PLANKS UNLESS NOTED OTHERWISE.
3. REFER TO F09 FOR FOOTING EXPOSURES.

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

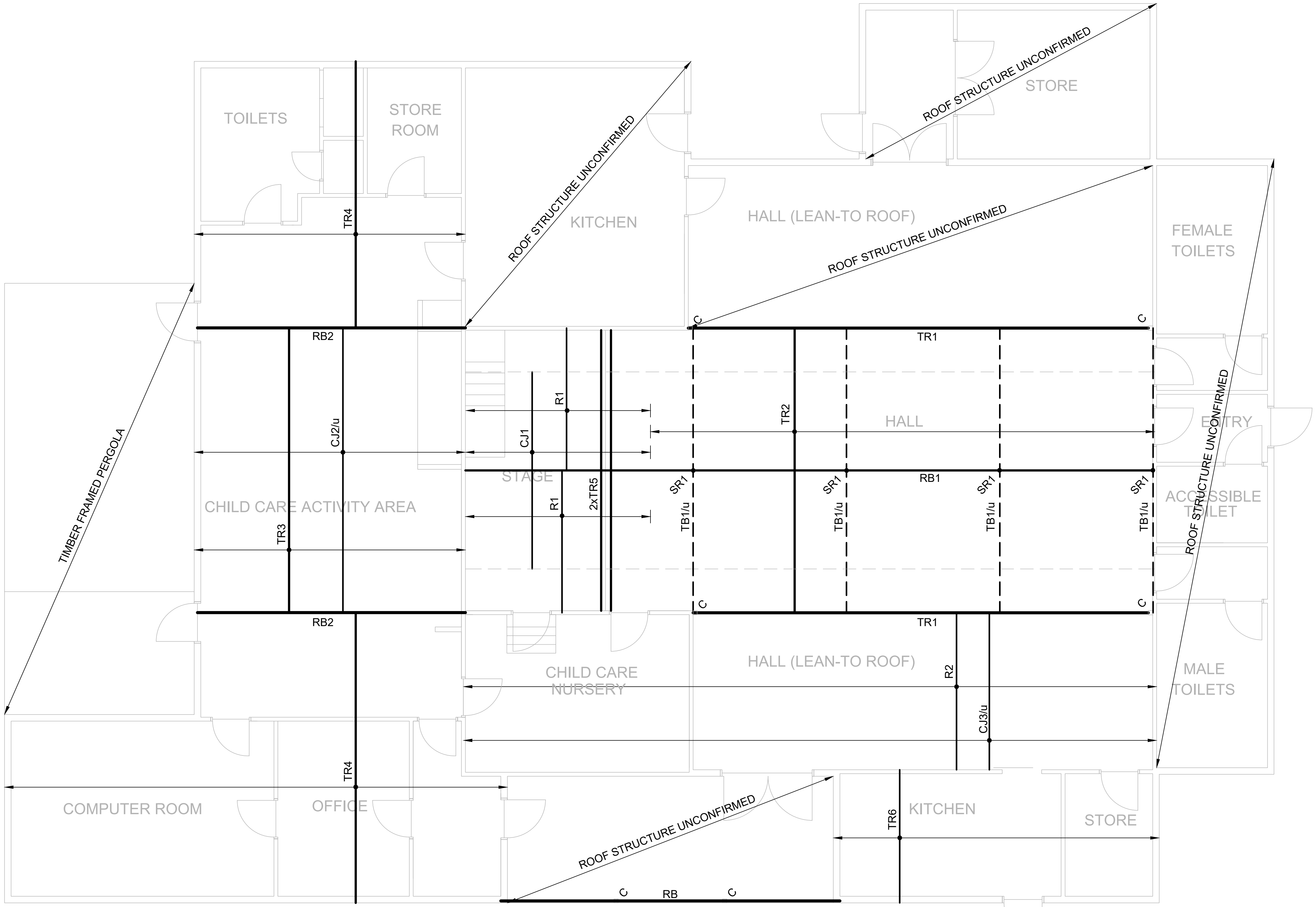
CLIENT
SURF COAST SHIRE

DRAWING TITLE
EXISTING FOOTING & FLOOR FRAMING LAYOUT PLAN

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F07 of 11	X1



EXISTING ROOF FRAMING LAYOUT PLAN 1:100

NOTES:
1. CJ/u DENOTES MEMBER UNDER
2. REFER TO F06 FOR MEMBER SCHEDULE
3. ALL MEMBER LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED ON SITE

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

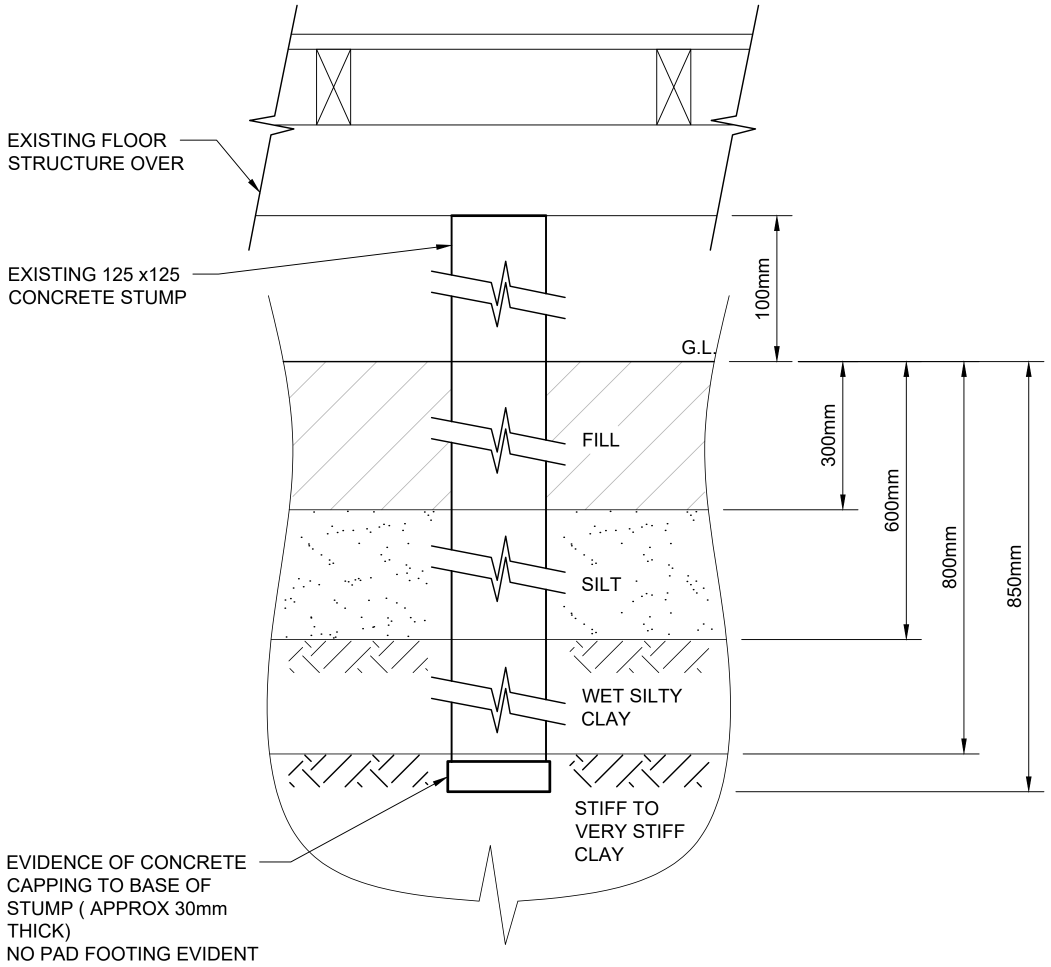
CLIENT
SURF COAST SHIRE

DRAWING TITLE
EXISTING ROOF FRAMING LAYOUT PLAN

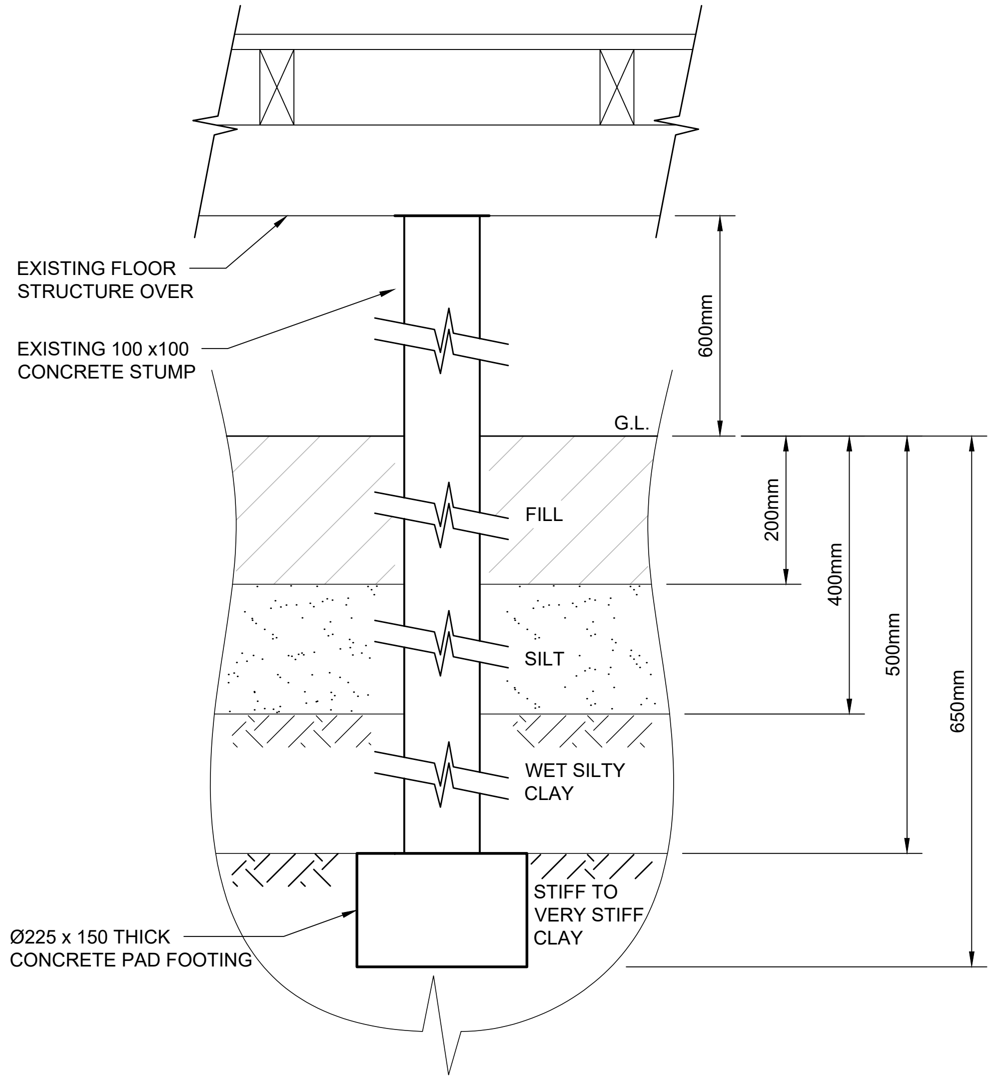
ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

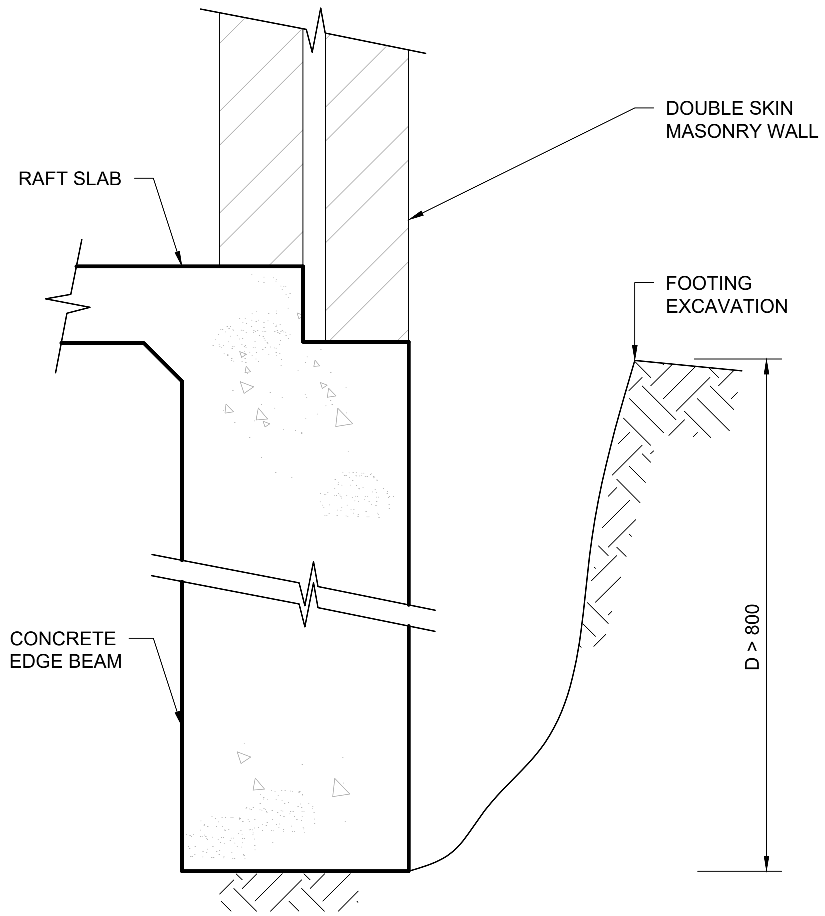
PROJECT No.	DRG No.	REV
23688	F08 of 11	X1



FOOTING EXPOSURE 1



FOOTING EXPOSURE 2



FOOTING EXPOSURE 3

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

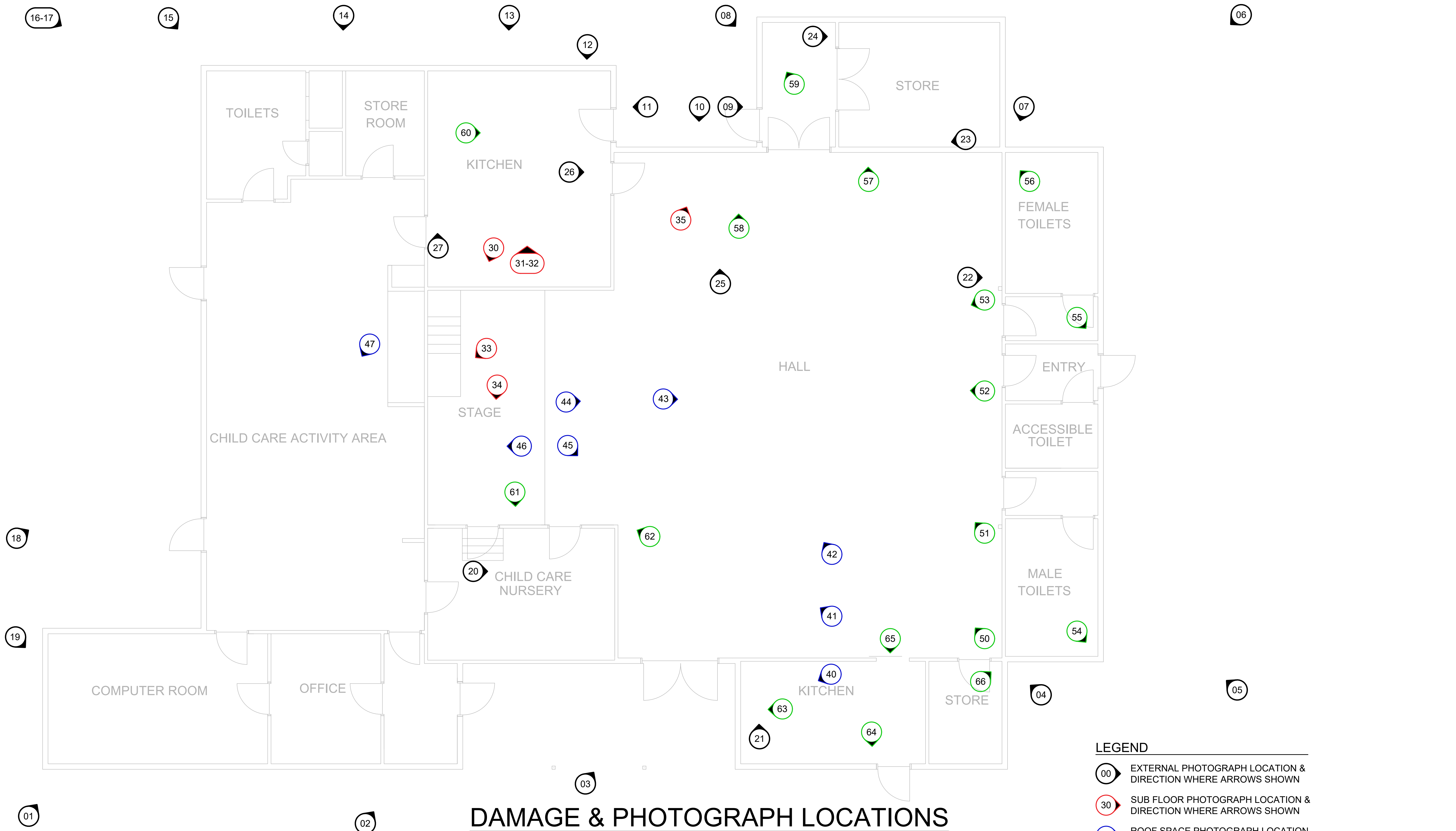
CLIENT
SURF COAST SHIRE

DRAWING TITLE
FOOTING EXPOURES

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F09 of 11	X1



DAMAGE & PHOTOGRAPH LOCATIONS

1:100

DO DO NOT SCALE FROM THESE DRAWINGS, ALL DIMENSIONS ARE APPROXIMATE ONLY AND SHALL BE CONFIRMED ON SITE.

LEGEND

- 00 EXTERNAL PHOTOGRAPH LOCATION & DIRECTION WHERE ARROWS SHOWN
- 30 SUB FLOOR PHOTOGRAPH LOCATION & DIRECTION WHERE ARROWS SHOWN
- 40 ROOF SPACE PHOTOGRAPH LOCATION & DIRECTION WHERE ARROWS SHOWN
- 50 INTERNAL PHOTOGRAPH LOCATION & DIRECTION WHERE ARROWS SHOWN

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP

P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

CLIENT
SURF COAST SHIRE

DRAWING TITLE
EXISTING BUILDING PHOTOGRAPH LOCATIONS PLAN

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

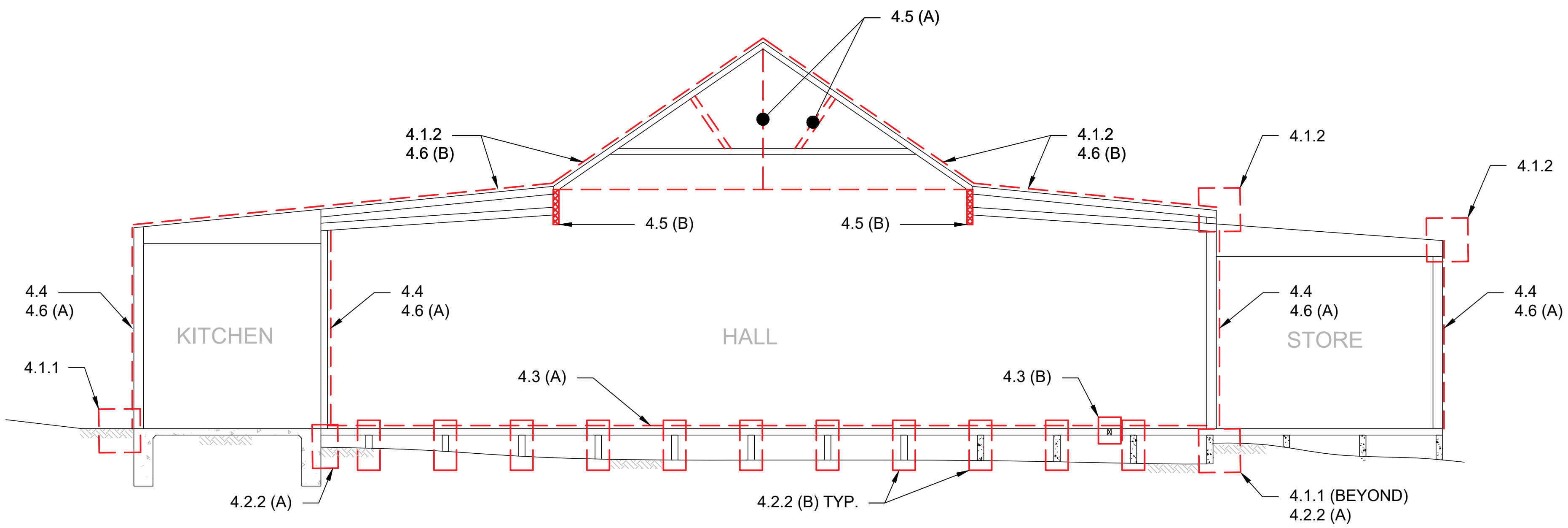
STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F10 of 11	X1

OBSERVED ISSUES

REPORT SECTION (REFERENCE #)	DESCRIPTION
4.1.1	POOR SITE / PERIMETER DRAINAGE.
4.1.2	ROOF DRAINAGE ISSUES.
4.2.2 (A)	POOR SUBFLOOR CLEARANCE AND VENTILATION.
4.2.2 (B)	STUMP FAILURE/DEGRADATION AND/OR MOISTURE ISSUES.
4.3 (A)	LIMITED FLOORING CAPACITY
4.3 (B)	FB2 INADEQUATE
4.4	WALL FRAMING CONDITION & TIE DOWN (UNKNOWN - FURTHER INVESTIGATION REQUIRED)
4.5 (A)	INADEQUATE TRUSS FRAMING TO R1 & CJ1 (OVER STAGE AREA)
4.5 (B)	TR1 STEEL TRUSS ISSUES
4.6 (A)	INADEQUATE WALL BRACING
4.6 (B)	INADEQUATE ROOF BRACING

NOTE: THE OBSERVED ISSUES NOTED ABOVE IS A NON-EXHAUSTIVE LIST. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE BUILDING CONDITION REPORT (REFERENCE 23688_F1).



TYPICAL BUILDING CROSS SECTION 1:100

NOTES:
1. THE ABOVE SECTION IS DIAGRAMMATIC REPRESENTATION OF SOME MAJOR OBSERVED ISSUES (NOTE: NOT ALL OBSERVED ISSUES SHOWN).
2. REFER TO BUILDING CONDITION REPORT 23688_F1 FOR FURTHER DETAILS.

DO NOT SCALE

REV	DESCRIPTION	BY	CKD	DATE
X1	INFORMATION ISSUE	AM	BK	10/09/21

YTTRUP
P.J. YTTRUP & ASSOCIATES PTY LTD
CONSULTING ENGINEERS
33 ROBERTS ROAD
BELMONT VIC 3216
P: 03 5243 3388
E: admin@yttrup.com
W: www.yttrup.com
ACN: 005 909 919 ABN: 71 687 799 203

PROJECT
DEANS MARSH COMMUNITY HALL
20 PENNYROYAL VALLEY RD,
DEANS MARSH

CLIENT
SURF COAST SHIRE

DRAWING TITLE
TYPICAL BUILDING CROSS SECTION

ENGINEER	DRAWN	CHECKED	SCALE @ A3
BK	AM	NM	1:100

STATUS
INFORMATION
NOT FOR CONSTRUCTION

PROJECT No.	DRG No.	REV
23688	F11 of 11	X1

APPENDIX C
Site Photographs

P.J. YTTRUP & ASSOCIATES PTY LTD | CONSULTING ENGINEERS

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

Photo 01 - External.jpg

Photo 02 - External.jpg

Photo 03 - External.jpg

Photo 04 - External.jpg

Photo 05 - External.jpg

Photo 06 - External.jpg

Photo 07 - External.jpg

Photo 08 - External.jpg

Photo 09 - External.jpg

Photo 10 - External.jpg

Photo 11 - External.jpg

Photo 12 - External.jpg

Photo 13 - External.jpg

Photo 14 - External.jpg

Photo 15 - External.jpg

Photo 16 - External.jpg

Photo 17 - External.jpg

Photo 18 - External.jpg

Photo 19 - External.jpg

Photo 20 - External.jpg

Photo 21 - External.jpg

Photo 22 - External.jpg

Photo 23 - External.jpg

Photo 24 - External.jpg

Photo 25 - External.jpg

Photo 26 - External.jpg

Photo 27 - External.jpg

Photo 30 - Subfloor.jpg

Photo 31 - Subfloor.jpg

Photo 32 - Subfloor.jpg

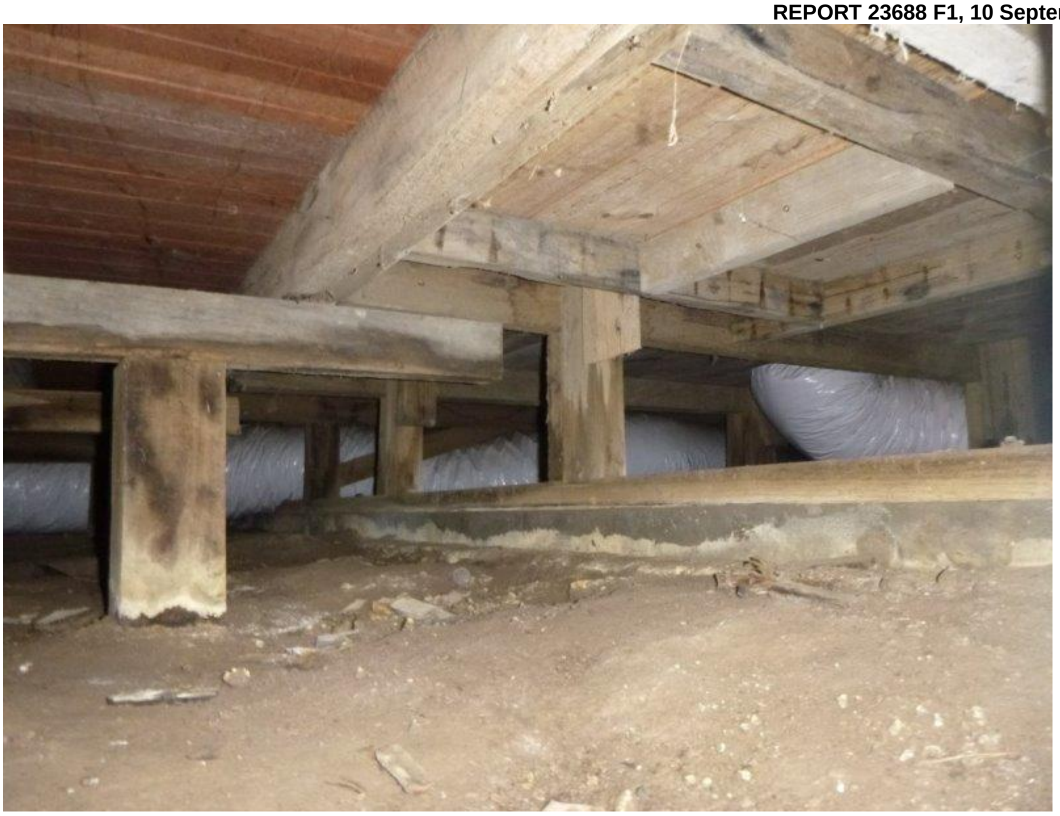


Photo 33 - Subfloor.jpg

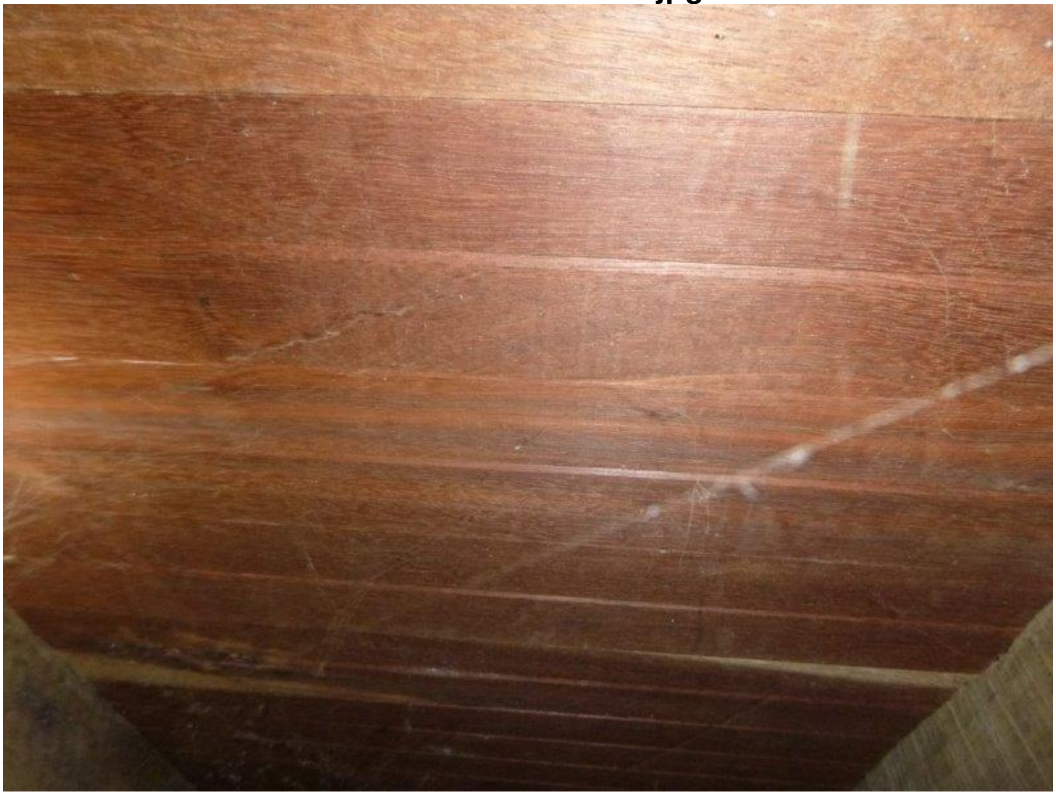


Photo 34 - Subfloor.jpg

Photo 35 - Subfloor.jpg

Photo 40 - Roof Space.jpg

Photo 41 - Roof Space.jpg

Photo 42 - Roof Space.jpg

Photo 43 - Roof Space.jpg

Photo 44 - Roof Space.jpg

Photo 45 - Roof Space.jpg

Photo 46 - Roof Space.jpg

Photo 47 - Roof Space.jpg

Photo 50 - Internal.jpg

P.J. YTTRUP & ASSOCIATES PTY LTD | CONSULTING ENGINEERS

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

Photo 51 - Internal.jpg

Photo 52 - Internal.jpg

Photo 53 - Internal.jpg

Photo 54 - Internal.jpg

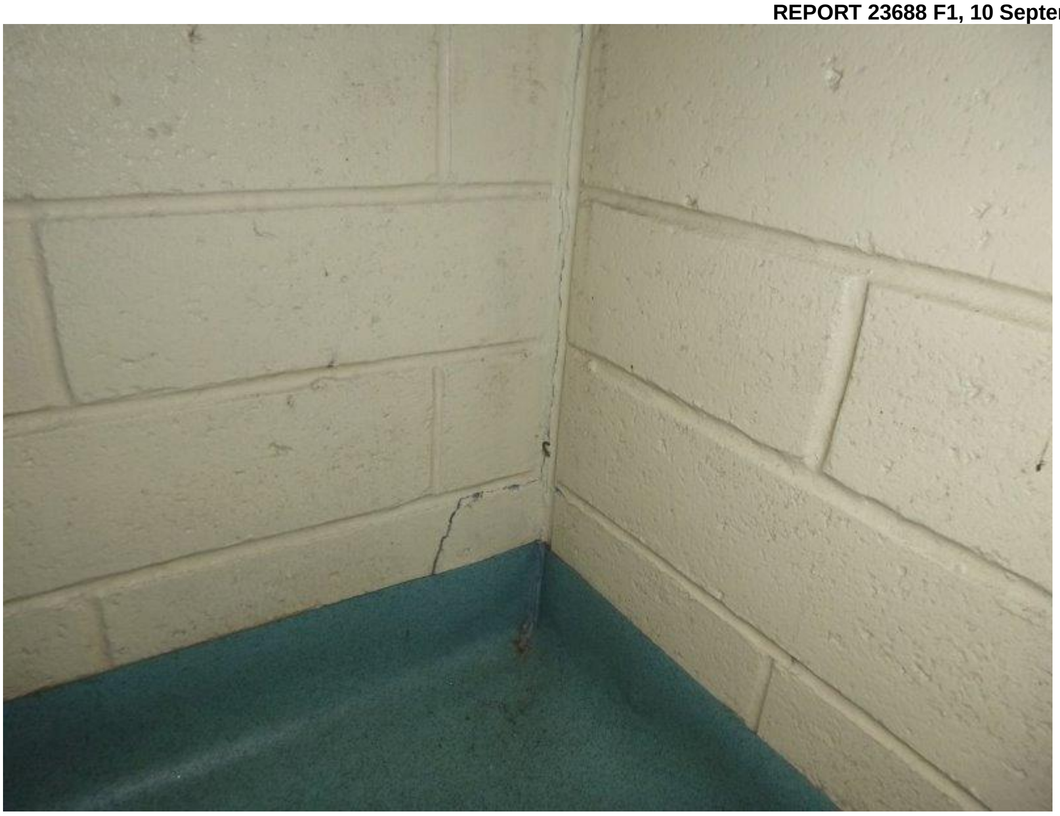


Photo 55 - Internal.jpg

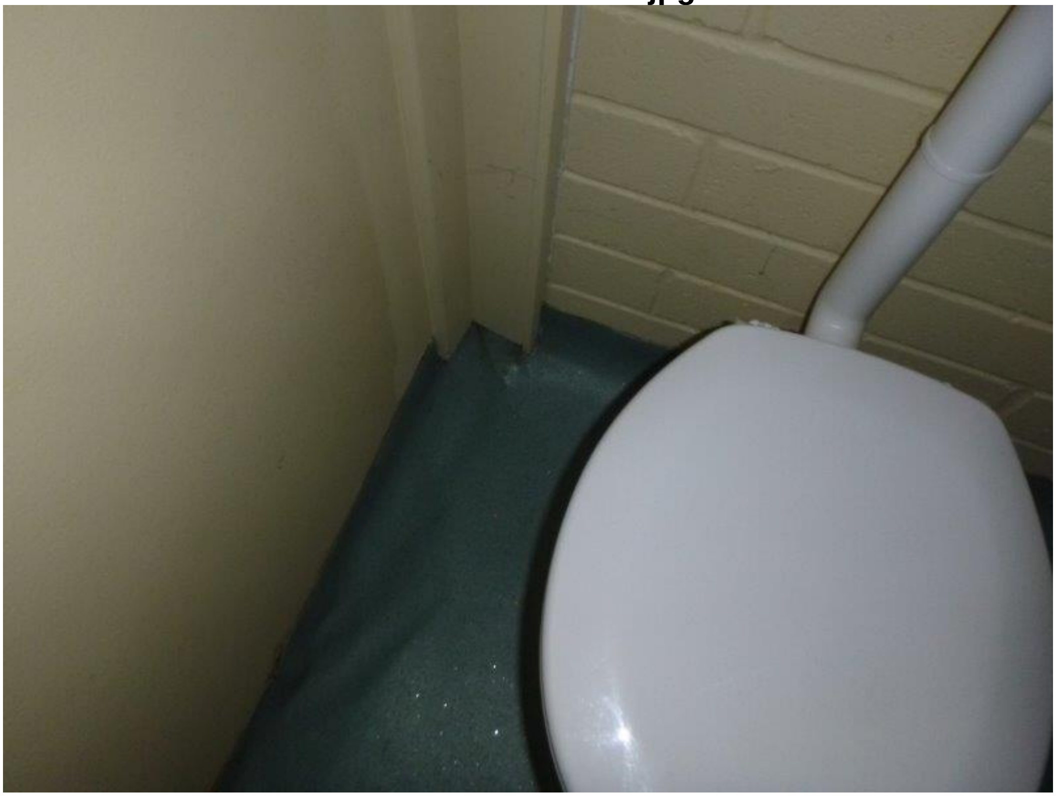


Photo 56 - Internal.jpg

Photo 57 - Internal.jpg

Photo 58 - Internal.jpg

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com

A.C.N. 005 909 919
A.B.N. 71 687 799 203

Photo 59 - Internal.jpg

Photo 60 - Internal.jpg

Photo 61 - Internal.jpg

Photo 62 - Internal.jpg

Photo 63 - Internal.jpg

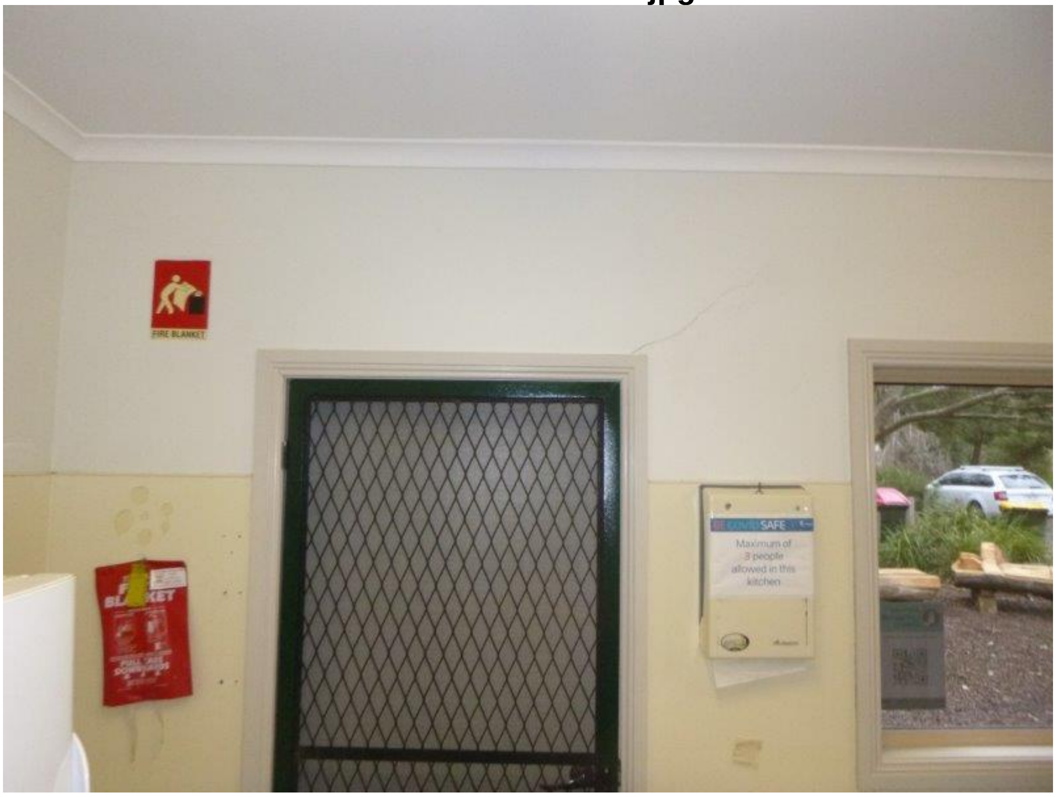


Photo 64 - Internal.jpg

Photo 65 - Internal.jpg

Photo 66 - Internal.jpg

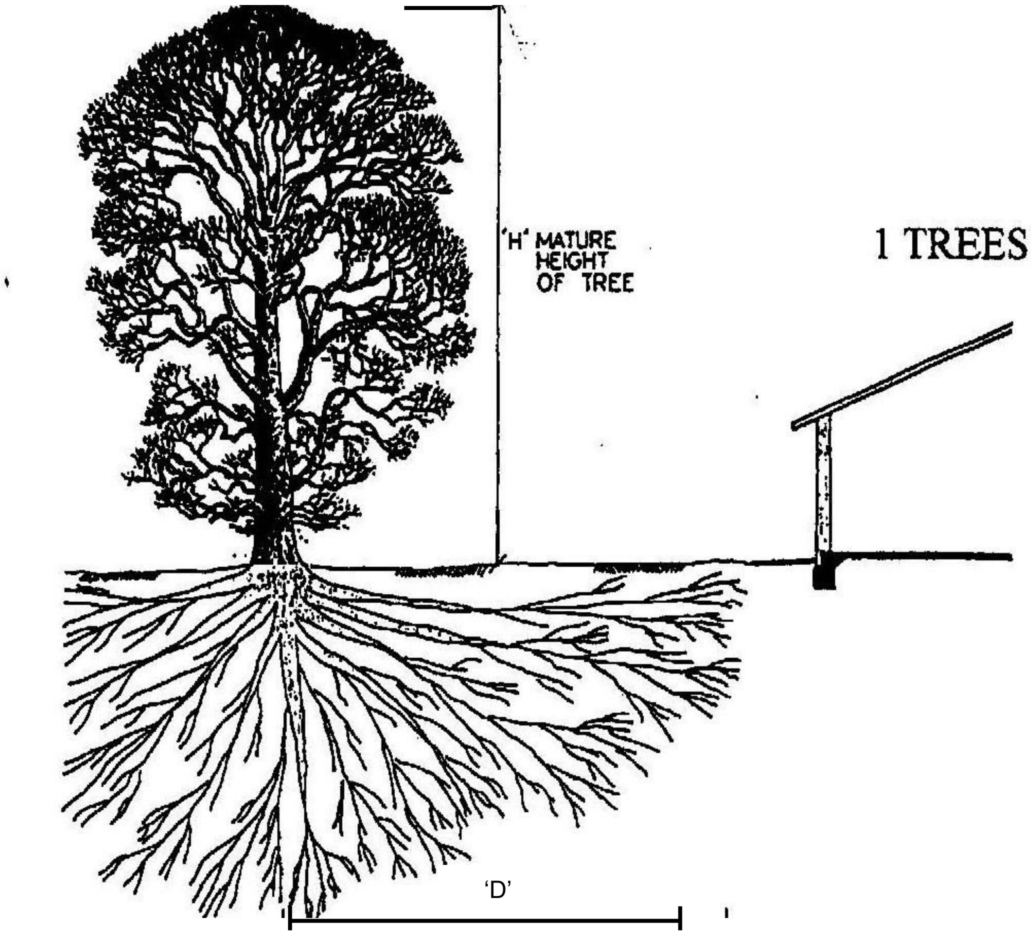
APPENDIX D

General Notes 1 to 3;
CSIRO Sheet 10-91 –
"Guide to home owners on foundation maintenance and footing performance"

33 ROBERTS ROAD, BELMONT VIC 3216
P: 03 52433 388
E: admin@yttrup.com
W: yttrup.com
A.C.N. 005 909 919
A.B.N. 71 687 799 203

GENERAL NOTES – SHEET 1

It is important to prevent the development of localised wet or dry areas at the perimeter of the proposed building.
In domestic or light weight construction, built on clayey soil, these wet or dry areas can result in differential ground movement and cause distress to the super-structure.
For this reason it is important for the builder and home owner to understand and realise the necessity of the following precautions.



Possible Zone of Soil Significantly Affected by Root System.

One Tree	D up to 1H	Class M Sites	D up to ¾ H
Class H Sites	D up to 1H	Class E Sites	D up to 1 ½ H

For a Row of Trees Increase H by 50%

IN CLAYEY SOILS

- Trees should be planted at a reasonable distance away from the proposed dwelling. A distance equivalent to the expected mature height of the tree is considered reasonable.
- Trees should be selected with the above information in mind.
- Information can be obtained from nurserymen on the selection of, and possible growth characteristics of, most trees and shrubs.

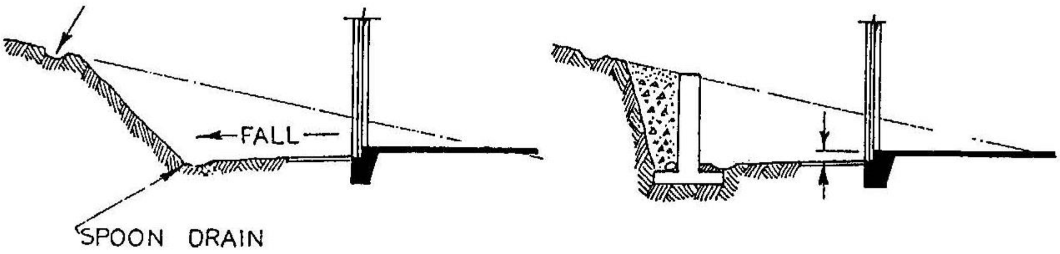
REPORT 23688 F1, 10 September 2021

GENERAL NOTES – SHEET 2

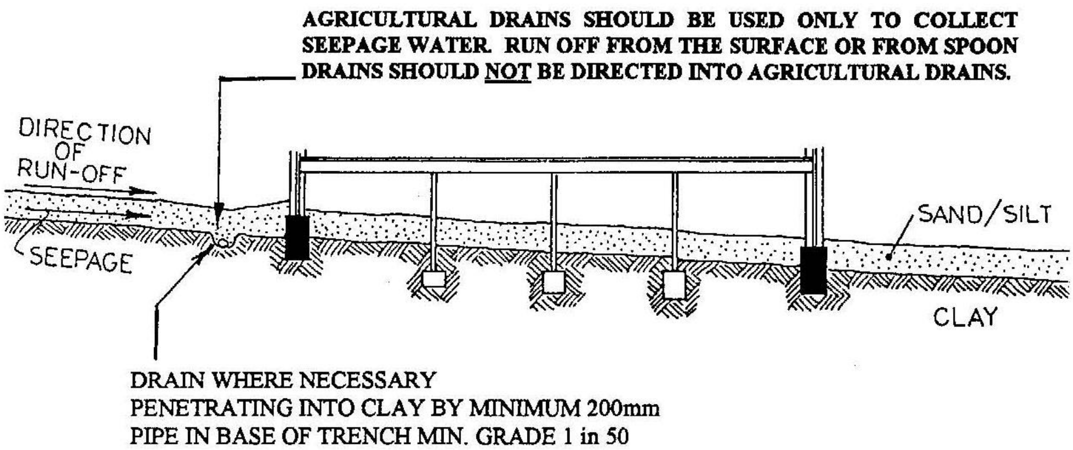
2 DRAINAGE

It is essential that the site be well drained to prevent any excessive build-up of moisture under footings or slabs. (In clayey soil, localised wetting up or drying out of the soil can result in heave or settlement within the soil foundation. Brickwork and / or structural damage can result from such movement).

SPOON DRAIN TO COLLECT RUN OFF WATER AND PREVENT SCOURING TO FACE OF CUTTING



- On slope or low lying sites concrete slabs must be raised off the ground and adequate drainage provided so as to prevent any possibility of storm water inundations.



Problems can occur at sloping sites where topsoil, silts, and sands overlay stiff clay. The downhill flow of seepage water can be stopped at a footing which is excavated into the clay. This dammed up water can produce undesirable wet areas. It may prove necessary to provide an agricultural drain to remove this water (see sketch above).

SCHEMATIC DRAWING NOT TO SCALE

GENERAL NOTES – SHEET 3

3 PATHS AND PAVING

- The soil around the perimeter of all dwellings should be graded to fall away from the external walls.
- In Highly Reactive clay areas, perimeter paving is recommended. This provides some degree of protection to the foundation soils from seasonal moisture change.
- All paths should be graded to shed water away from the dwelling.

---

4 FLEXIBILITY OF CONSTRUCTION

For dwellings built on clayey soils the house super-structure should be designed to have some degree of flexibility in order to cope with possible footing movement that may occur.

Flexibility of the super-structure is achieved by articulating the brickwork to the Cement and Concrete Association Technical Note 61, “Articulated Walling”. Following are some example locations of joints.

- Use floor to ceiling windows and doors where possible.
- Use timber panels above windows in place of brickwork.
- Provide movement joints at –
    - Half-height windows.
    - Large expanses of brickwork.
    - Between old and new construction.
    - Between one and two storey sections.
    - Between wing walls and the main structure.

*** The above “movement joint locations” are examples only. The number and location of joints must also be considered from an aesthetic viewpoint. Where joints are considered unsuitable it may prove necessary to provide additional reinforcement to the brickwork.

---

5 SERVICE TRENCHES AND EASEMENTS

To avoid the detrimental and unwanted formation of wet or dry areas close to the building, particularly in clay soil, and to avoid interference to footings and slab beams, it is important that all service trenches be located well clear of the building perimeter and be kept to minimum acceptable depth.

The building footings must be capable of catering for the effects of any easements on this property or the neighbouring properties.

CSIRO

Improving the Built Environment
information sheet

Sheet No. 10–91 Revised August 1996

Guide to home owners on foundation maintenance and footing performance (updated for AS 2870–1996)

Introduction

This guide was prepared by Dr P.F. Walsh, formerly of CSIRO and now with the University of Newcastle, with advice from the Standards Australia Committee on Residential Slabs and Footings, to provide guidance to home owners on their responsibilities for the care of clay foundations, and to discuss the performance that can be expected from a footing system. (The ground that supports a house is called a foundation, and the concrete structure that transfers the load to this foundation is the footing system.)

The best information about the design and construction of footing systems is contained in the Australian Standard AS 2870 'Residential Slabs and Footings'. The Standard gives a system of site classification, prescribed footing and slab designs, and construction methods that provide an excellent footing system for Australian houses. However, a warning is given that the chance of a footing failure is higher if extreme site conditions are permitted to occur, viz.:

- growth of trees too close to a footing;
- excessive or irregular watering of gardens adjacent to the house;
- lack of maintenance of site drainage; and
- failure to repair plumbing leaks.

The Standard further states that compliance with this guide is a way to avoid extreme site conditions.

Clay foundations are the cause of major problems for houses. Clays are very fine-grained soils that are plastic and sticky when wet, and hard and strong when dry. All clays swell or shrink to some degree as they become wet or dry out. 'Reactive' clays swell or shrink to such an extent that foundation movements can damage houses.

All house sites are classified. Reactive-clay sites are classified as S, M, H or E, in order of increasing reactivity. Proper maintenance of such clay sites requires that the moisture content of the clay should be kept reasonably constant.

Some minor cracking of masonry walls on reactive clay sites is almost inevitable despite proper design, construction and maintenance. Very slight cracks (up to 1 mm wide) could be expected in most houses. Larger cracks (up to 5 mm) may occur in some houses with properly designed and constructed footings if reactive clay sites have been subject to large changes of moisture. Cracks larger than 5 mm are regarded as significant damage.

Non-reactive sites – sands, silts and certain clays of class A or S – need only be protected from becoming extremely wet. This requires adequate attention to site drainage and prompt repair of plumbing leaks.

Further information on these topics is given in the following sections. The guide has been updated to be consistent with the revised edition of AS 2870 (1996).

Site classification

AS 2870 requires all sites to be classified. The emphasis has been placed on reactive clays that swell and shrink with changes of moisture content, because these are the most common cause of problems. The classification system is fairly complicated but, as a general guide, the following may be helpful in understanding the system for clay sites.

S Clays that have not given trouble in the past.

M Moderately reactive clays that may cause minor damage to brick houses on old-style light strip footings. Moderately reactive clays are common.

H Highly reactive clays that often damage houses, paths and fences.

E Extremely reactive clays that frequently damage houses even with strong footings. Generally rare in major cities except Adelaide. Other occurrences include outback NSW, Darling Downs, Geelong and Horsham.

Since the precautions necessary depend on the reactivity of the site, the owner should check the classification that is shown on the house plans.

The maintenance of the building and the site is the responsibility of the owner, and so the owner should be familiar with the requirements of this guide.

Care of clay foundations

All clays move with changes of moisture content, so the aim is to minimise such changes in the clay by:

- draining the site;
- keeping gardens and trees away from the house;
- adequate but moderate garden watering; and
- repairing plumbing leaks.

This sheet is available from **CSIRO** PUBLISHING • Freecall **1800 - 645051**
CSIRO PUBLISHING, PO Box 1139, Collingwood, Vic 3066, Australia

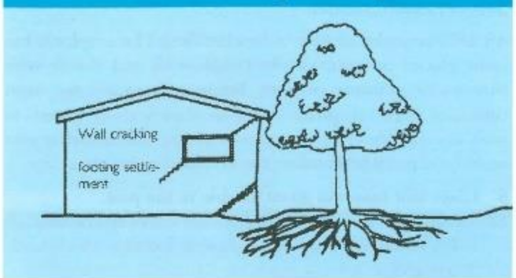
 ISSN 0314-5956

On a reactive-clay site there are some restrictions on the way the owner can safely develop the garden around the house. These restrictions apply mainly to brick houses. In most cases, only minimal precautions are justified for framed houses clad with timber or sheeting.

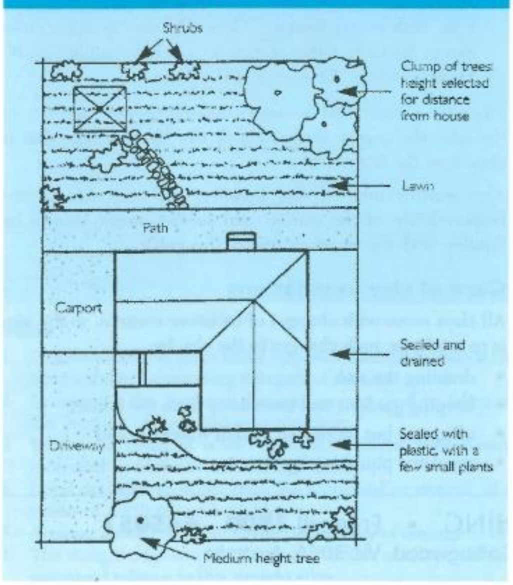
The site must be well drained. Under no circumstances should water be allowed to lie against the house or even near the house. The ground immediately next to the house should be graded away with a slope of about 50 mm over the first metre. Suitable surface drains should be provided to take the surface water away from the house. Where topsoil is brought in, it should not interfere with the site drainage, nor should it raise the ground level enough to block the weepholes in the brick walls or any subfloor vents. Even the subfloor of houses with timber floors should be drained so that water does not collect under the house.

Large garden beds are best not located near the house. This will avoid the possibility of introducing too much moisture to the foundation clay by overwatering. The zone near the house should be planned for paths or covered with gravel and plastic sheeting. Small shrubs may be planted at reasonable spacings.

Trees cause shrinkage and damage



Gardens for reactive site



Gardens and lawns should be watered adequately but not excessively. Uniform, consistent watering can be important to prevent damage to the foundation during dry spells such as droughts or dry summers.

Trees and large shrubs require substantial amounts of water, and if the soil near the tree dries out, the roots will extend in search of soil moisture. Tree watering is important in late summer and in drought. The use of slow-drip watering systems may be appropriate. It has also been found useful to drill holes near trees and fill them with gravel to allow water better access to the tree roots. Otherwise, clays will shrink as they dry, and a house may settle as shown below.

Removal of large trees creates the opposite problem. As soil moisture is gradually restored, clays swell and may lift shallow footings.

Many factors determine the extent of clay drying by trees. The more important include soil type, and the size, number and species of trees. Trees obtain moisture from roots that spread sideways, and the drying zone is influenced by the extent of these roots. For single trees, the drying zone is usually half to twice the tree height, but the zone may be larger for groups or rows of trees. Although it is known that the species can influence the extent and severity of the drying zone, little definite information is available. Some Australian trees are particularly efficient in extracting water from very dry soils and can be more dangerous than non-Australian species that use large amounts of water in normal conditions. The effect of tree drying on the amount of movement is also related to the reactivity of the clay. To minimise the risk of damage, trees (especially groups of trees) should not be planted near the house on a reactive clay site, and the following limits are recommended:

$d = 1.5\,h$ for Class E sites

$d = 1\,h$ for Class H sites

$d = 0.75\,h$ for Class M sites

where d is the distance of the tree from the house, and h is the eventual mature height of the tree. These values should be increased by 50% if the trees are in a dense group. These rules mean that on the average suburban block, trees that grow higher than 8–9 m are often impractical unless the owner accepts the risk of some damage to the house. If large trees are desired, it may be practical to adopt a specially designed footing system, e.g. a piled footing system.

A leak in the plumbing can cause the footings of a house on a reactive clay to move. The water seeps into the clay causing it to swell and push the footing system upwards. Any obvious leaks in stormwater, drainage or sewerage pipes should be investigated. Leaking water pipes can be detected by turning off all the taps and checking if the water meter records any flow.

The above restrictions may seem onerous for new home owners, but lack of site maintenance on a reactive clay can cause damage to the house. The whole issue should be kept in some perspective. The damage to houses caused by reactive clays is mostly unsightly cracks in the brickwork. In the typical Australian brick-veneer house, the brickwork does not support the structure. It is the timber frame that carries the walls and roof loads, so brick cracks do not affect the structural safety of the house.

If owners choose to disregard some of the above restrictions and, say, plant large trees all around the house, they should not blame the builder, the engineer or the Council if the house suffers some cracking.

Performance of footing systems

All building materials move. Concrete and timber shrink, bricks grow, and so on. Many building practices have been evolved to reduce the damage that such movements cause, and the minor difficulties that arise are usually repaired without significant problems.

Where footings are designed by an engineer, the basis of the design is the limitation of any vertical movement that might occur between the centre of the wall and a line joining the ends of the wall. This is termed the differential movement and limits are given in AS 2870 for various forms of house construction. For example, a masonry veneer house with articulation joints is designed for a movement limit of 30 mm. The amount of this movement at a house can be checked using a level or even a string line along a brick course in the wall. If the vertical differential movement is less than the prescribed limit then the footing system has performed up to standard.

Masonry wall cracking can have many causes other than footing movement, including bricks growing as they absorb moisture, the structural or shrinkage movements of the frame within the veneer skin or even accidental damage during construction. If the cracking is less than a few millimetres it is virtually impossible to determine the cause. Certainly if there is no evidence of excessive differential movement then footings should not be regarded as the cause of the cracking.

However, it must be accepted that on reactive clay sites, particularly Class H and E, some movement is likely and for some sensitive houses cracking may occur even for footings performing within expectations. In order to set realistic expectations, AS 2870 contains Appendix C which is included in this report.

The performance requirement of AS 2870 suggests that Category 0 to 1 damage may be expected for houses on a reactive-clay site, but that the damage is of little consequence. Category 2 damage (isolated cracks up to 5 mm wide) is clearly not satisfactory, but it still does not constitute significant failure and could be expected to occur under adverse environmental conditions.

For these categories of damage, it is the intention of AS 2870 that consequent repairs are part of the normal house maintenance, although during the warranty period this may be the responsibility of the builder.

Nonetheless, to ensure that the damage does not proceed to a more serious state, the owner should take some action.

- Check that the recommendations on site treatment, drainage, garden arrangement, trees etc., have been observed.
- Keep a record of the crack width against the time of the year. If the damage is as high as Category 2 and seems to be increasing, the owner should consult the builder who may be able to offer more specific advice. If this does not prove satisfactory, the owner should engage a consulting engineer who specialises in house footings.
- Engage a plumber to check for leaks if this is suspected to be the cause.
- Replace soil moisture in dry spells by watering. Such watering can be more effective if holes or trenches are dug into the clay. The holes or trenches should be filled with compacted crushed rock or gravel and moderately watered. Some trees may need to be removed or kept pruned.

Complete stability is difficult to achieve, so repairs to damaged walls should include methods that will disguise further movements. Extra joints should be included in external masonry walls and further cracking in internal walls can be concealed by flexible paints, wall paper or panelling. Repairing of cracks with brittle fillers should be avoided unless the cracks have stabilised.

For the more serious categories of damage, the steps to be taken are similar, but there should be little delay in seeking advice. Remedial action for significant failure may still only include attention to stabilising moisture conditions as described above, but could also involve constructing a concrete path or a wall in the ground to stop drying of the foundation clay. Walls may even be designed to span over sagging footings or to cantilever beyond sagging footings. Underpinning is usually not satisfactory in reactive clays.

Experience indicates that lack of maintenance is responsible for many failures. Even with proper design and site maintenance the occasional failure may still occur because footing behaviour is so complex.

Shrinkage of concrete floors

Concrete needs water. Firstly to allow the fresh concrete to flow, and secondly to develop strength during its first few weeks. As a slab starts to dry, it shrinks and tries to contract. Some of this movement is restrained or resisted by friction on the bottom of the slab and by the beams in the ground. This restraint causes tension or stretching forces in the slab and these forces are often large enough to crack the slab.

Shrinkage cracking is almost inevitable and does not represent failure. Most owners never notice the cracks because they often do not occur until after the carpets are laid. Cracks under brittle or sensitive floor coverings are of concern, but the risk of damage can be reduced by using flexible mortars and glues for fixing slate and tiles etc. Also it helps to delay installing the floor covering until after the shrinkage has occurred. The length of delay should be at least three months after the slab has started to dry (i.e. from the time the slab is last wet from rain or during construction).

Adhesive-fixed floor coverings

A concrete slab takes a long time to dry. For example, under temperate conditions a slab will take about three months to dry. Moisture in the concrete can interfere with the bond or break down the adhesive used to attach floor coverings. However, a range of adhesives is available for various floor coverings and these should perform quite well on slabs that have been allowed to dry sufficiently. If there is any doubt, the moisture condition of the slab should be assessed before coverings are placed.

Conclusion

This guide has been prepared to advise owners on how to care for the foundation of their houses and what to expect from a well-designed footing system. The main concern with foundation maintenance is to prevent the foundation soil becoming too wet or too dry, and a variety of recommendations are given to achieve this.

Further information

Cameron, D. A. & Earl, I. 1982, *Trees and Houses: A Question of Function*, Cement & Concrete Association, Melbourne.

Cameron, D. A. & Walsh, P. F. 1984, *Damage to Buildings on Clay Soils*, Technical Bulletin 5.1, Australian Council of National Trusts.

CSIRO 1995, *House Cracking in Drought Periods*, Information Sheet No. 10–88, CSIRO Australia, Division of Building, Construction and Engineering, Melbourne.

Martin, K. G., Lewis, R. K., Palmer, R. E. & Walsh, P. F. 1983, *Floor Coverings on Concrete Slab-on-ground*, CSIRO Australia, Division of Building Research Report, Melbourne.

Disclaimer

Appendix C of As 2870

Table C1 Classification of damage with reference to walls

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depends on number of cracks	4

Table C2 Classification of damage with reference to concrete floors

Description of typical damage	Approximate crack width limit in floor	Change in offset from a 3 m straight edge centred over defect (see Note 5)	Damage category
Hairline cracks, insignificant movement of slab from level	<0.3 mm	<8 mm	0
Fine but noticeable cracks. Slab reasonably level	<1.0 mm	<10 mm	1
Distinct cracks. Slab noticeably curved or changed in level	<2.0 mm	<15 mm	2
Wide cracks. Obvious curvature or change in level	2–4 mm	15–25 mm	3
Gaps in slab. Disturbing curvature or change in level	4–10 mm	>25 mm	4

Notes:

1 Crack width is the main factor by which damage to walls is categorised. The width may be supplemented by other factors, including serviceability, in assessing category of damage.
2 In assessing the degree of damage, account shall be taken of the location in the building or structure where it occurs, and also of the function of the building or structure.
3 Where the cracking occurs in easily repaired plasterboard or similar clad-framed partitions, the crack width limits may be increased by 50% for each damage category.
4 Local deviation of slope, from the horizontal or vertical, of more than 1/100 will normally be clearly visible. Overall deviations in excess of 1/150 are undesirable.
5 Account should be taken of the past history of damage in order to assess whether it is stable or likely to increase.
6 The straight edge is centred over the defect, usually, and supported at its ends by equal height spacers. The change in offset is then measured relative to this straight edge.

Nov 97