Bartsch

BARTSCH CONSULT (Pty) Ltd

UMSUNDUZI MUSEUM

REPORT - ASSESSMENT OF EXISTING ROOF AND RAINWATER GOODS AT MAIN BUILDING

PREPARED BY
BARTSCH CONSULT

APRIL 2023

TABLE OF CONTENTS:

1. BACKGROUND

The uMsunduzi Museum precinct consists of multiple heritage buildings on a site located at the corner of Langalibalele & Boshoff Street in central Pietermaritzburg.

The original building was built around 1912 as a girl's school and which is now the main museum building and considered an AMAFA heritage building. Over the years the site has had numerous buildings added and adapted to form the museum precinct as it is currently, consisting of twelve individual buildings.

Bartsch Architects was appointed to assess the roof and rainwater goods on the Main Building, as the building has been experiencing severe leaks and water ingress during spells of heavy rains.

An in-situ inspections was carried out on 29 March 2023, to record the current condition of the roof covering, rainwater goods, waterproofing and other roof elements.

2. ASSESSMENT WITH RECOMMENDATIONS

2.1 ROOF COVERINGS

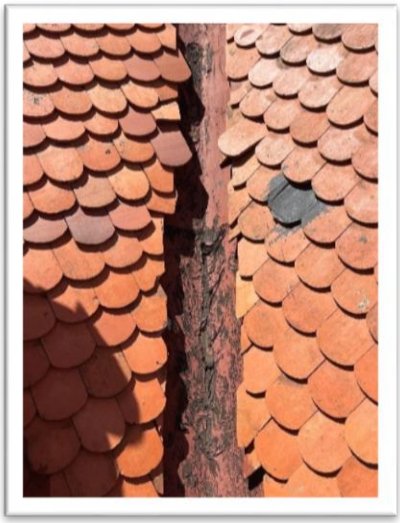
- <u>TILED ROOFS</u>

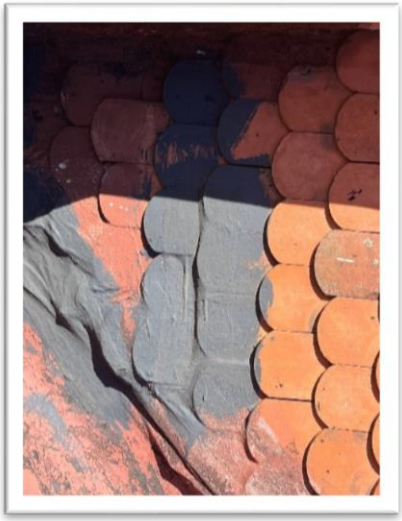
  The main building roof is of a hipped design, at an approximately 45-degree pitch, and covered with flat round cut- type clay tiles, fitted over timber battens with waterproof underlay (in majority of areas). These tiles are prone to damage from hail stones and have as a result been replaced, in sections, over the lifespan of the building. The tiled and flat portions of the roof was the subject of a repair contract in the recent past, although not of very good quality and workmanship. Several recent hailstorms since November 2022 have also seen a number of clay tiles being damaged or dislodged.

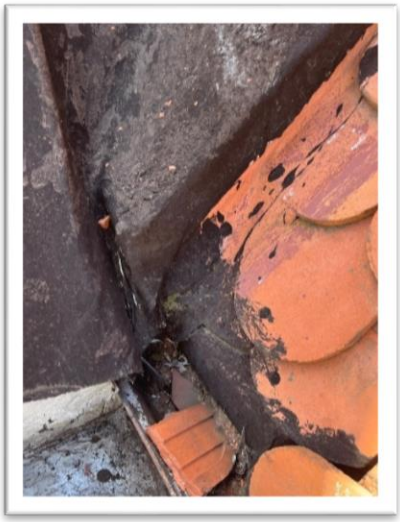
  The roof tiles are in overall good condition, with the Museum having some clay tiles in stock to facilitate localised replacement of broken tiles. Where tiles or ridge caps are broken or dislodged, it however allows water to ingress onto the support battens and eventual rotting and weakening of the timber battens. Localised bitumen sealing has been attempted in various areas as a preventative measure.

Water ingress onto ceilings and down walls are also results of dislodged and broken tiles. It was noted that the underlay, which acts as a waterproof barrier under the tiles, was also damaged in several places across the footprint of the building, which would allow water to penetrate onto ceilings and the timber trusses.

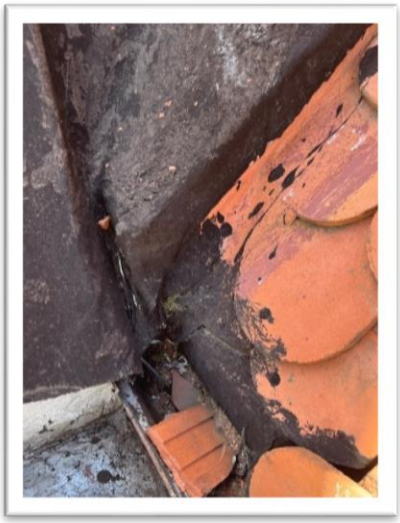
In roof valleys, it was evident that in several areas, the overlap joint between the metal valley and tile-edge was compromised, due to movement of the tiles. In several instances, the resulting leaks were poorly waterproofed with a waterproof membrane and bitumen paint, which is considered a temporary solution.

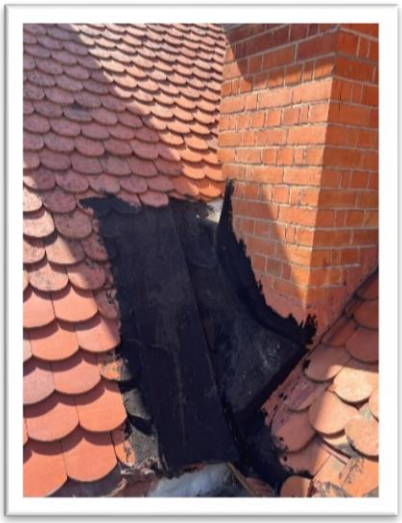


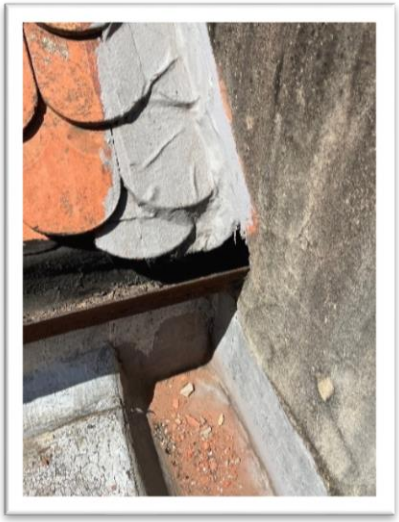


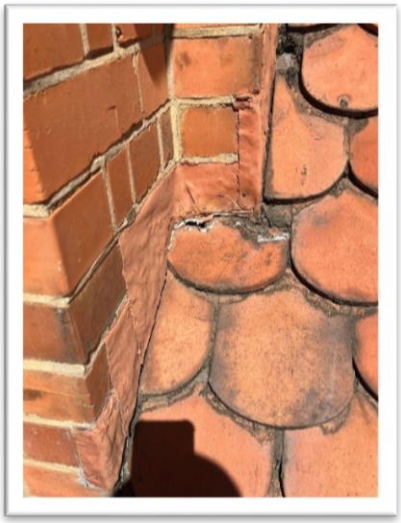


Flashing and counter flash waterproofing, where the tiles meet brickwork, is in most cases either missing, not correctly installed or poorly installed.









Tiled Roofs Proposed Recommendations:

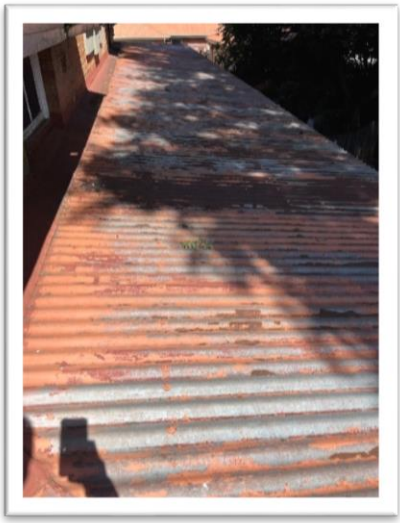
- Damaged and broken localised roof tiles to be removed and replaced with full whole units, as per stock currently on site.
  Special import tiles to match existing would need to be procured if site stock is not sufficient for these repairs.
- Minor damaged roof underlay to be repaired with DPM Jointing Tape, this only applies to smaller tears and holes.
- Where underlay is severely damaged and missing, this would need to have new underlay installed.
  These sections of roof would need to be uplifted to replace damaged underlay and any rotten battens. Only sections that can be done in a single day to be worked on.
- Damaged and temporary repaired valleys to be properly replaced with new sheet metal lined timber valleys.
  Existing valley tiles to be removed and existing sheet metal valley lining to be removed, timber valleys to be inspected and replaced with new when required. This to be done a single valley at a time (or only a number that can be fully repaired in a single day).

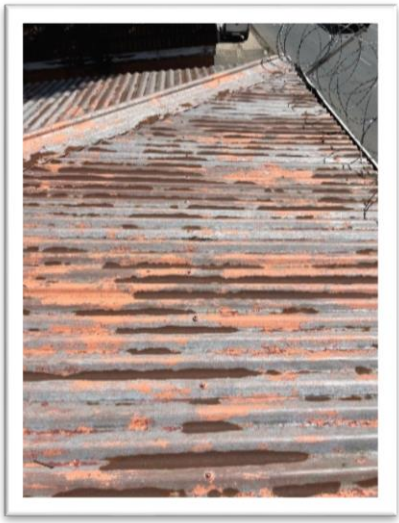
Timber valleys to be lined with sheet metal that has correctly sized ‘soaker’ setback. Valley tiles to be reinstated with correct amount of overlay into valley, this would require extra roof tiles.

- Incorrectly and poorly installed head and side wall flashing to be redone. This is to be done inspections that can be completed in a single day.
  Roof tiles to be removed (including all remedial applied waterproofing). Tiles to be removed to expose any metal flashing. Where flashing is damaged, this is to be removed, if not damaged then this may be reused.
  Stepped sidewall flashing and straight headwall flashing to be fitted to wall, with sufficient ‘soaker’ setback. Roof tiles to be refitted into place (with missing and broken tiles being fitted with new). Stepped sidewall counter flashing and straight headwall counter flashing to be fitted to wall (cut into brickwork) and over top of roof tiles (notched at each tile).

- <u>CORRUGATED IRON ROOFS</u>
  The corrugated iron roofs of the buildings are generally in good condition, considering the age of the building. The sheets show signs of paint deterioration, with rust becoming evident in areas.





Some roofs are laid at a 2° slope, which is too shallow an angle to provide sufficient run-off during bouts of rain.

The valleys on some of these sheet metal roofs were incorrectly waterproofed, in a possible attempt to counter the leaks. These roofs will leak because of the shallow slope, allowing water ingress to the areas below.

Loose fixing of some roofs was also noted, which may also indicate failure of the timber battens below because of old age and/ or rot.

Ridge caps, flashings and counter flashing are showing signs of failure and detaching from the wall and roof sheets, which would result in leaks during wind-driven rainfall.

Corrugated Iron Roofs Proposed Recommendations:

- Existing sheets to be removed and cleaned of all paint. Once inspected and considered adequate for reuse, they should be cleaned and prepared for reinstallation using new roofing screws and washers. Once fitted, roofs to be painted to match existing colour. All purlins to be checked for integrity, replace with new where required.
- Roofs with low pitches (once repaired as per above) should be coated with a monolithic water proof coating instead of paint, to match existing colour where possible.
- Damaged and temporary repaired valleys to be properly replaced with new sheet metal lined timber valleys.
  Existing sheets to be removed and existing sheet metal valley lining to be removed, timber valleys to be inspected and replaced with new when required. This to be done a single valley at a time (or only a number that can be fully repaired in a single day).
  Timber valleys to be lined with sheet metal that has correctly sized 'soaker' setback.

Valley sheets to be reinstated with new roof sheets for correct amount of overlay into valley.

- All loose and degraded roof sheet fixings to be replaced with new, once cleaned and replaced roof sheets are installed.
- Ridge caps, sidewall flashing and headwall flashing to be removed. Once repaired/ replaced roof sheets are fitted, new purpose bent sheet metal ridge caps and flashing to be installed. Correct counter flashing to be fitted, stepped on sidewall and straight on headwall.

- <u>FLAT- FORMED LEAD ROOFS</u>
  The flat-formed lead sheets used to cover the dormers and turrets are showing signs of age and are unclipping in many instances.

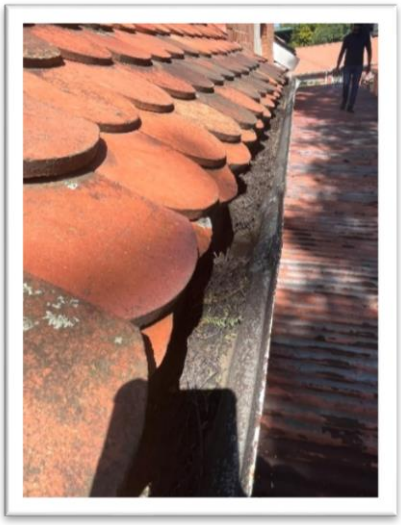
In general, these require all the flashing joints and ridges to be re-formed to seal and join together properly. Paint has weathered significantly and is peeling off these sheets and joints.

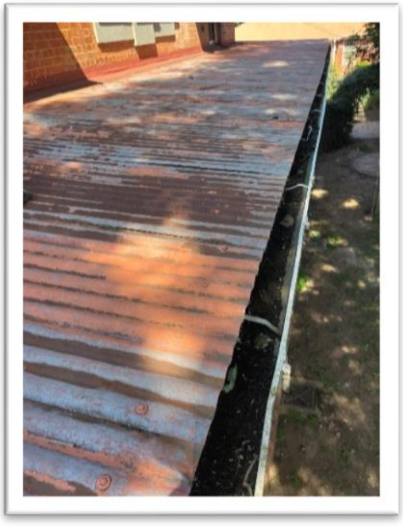
Flat-Formed Lead Roofs Proposed Recommendations:

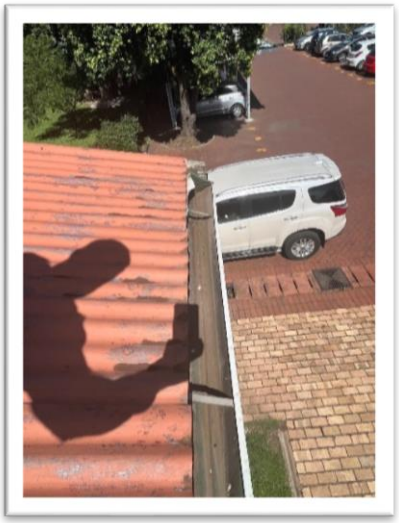
- All roof tiles around dormer and turret lead roof sheeting to be removed.
  Existing lead sheet metal to be removed and repaired, refit lead sheets over repaired/ new soaker flashing and correctly bind seams of ridges. All by specialist installer.
  Existing soaker flashing to be inspected and repaired/ replaced where necessary. This is to be done with lead sheet metal and by a specialist installer.
  Tiles to be refitted over the repaired/ new soaker flashing, new tiles to be fitted where required so as to reduce gap between flashing and tiles.
- Removed ridge pieces to be repaired or replaced, and fitted to newly replaced roof sheeting. Proper notching and capping to be done around seamed ridge joints.

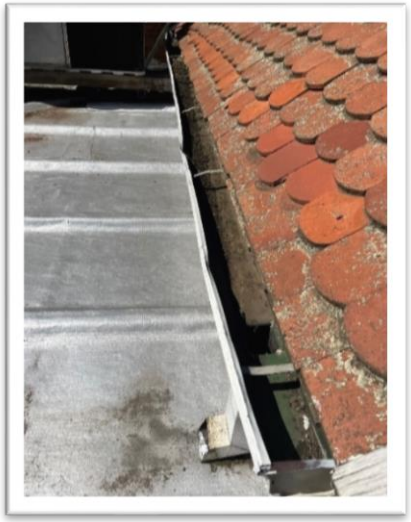
2.2 RAINWATER GUTTERS, DOWNPIPES, ETC.

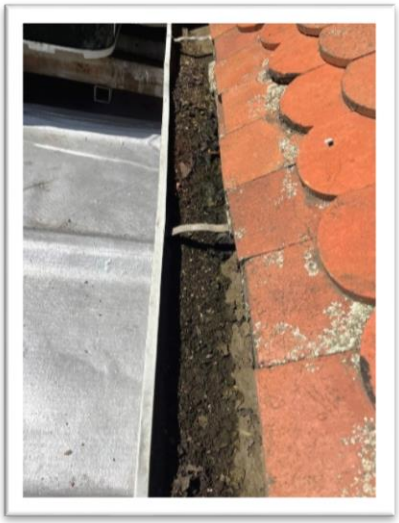
- GUTTERS
  Eave gutters on the entire building generally require cleaning and in some instances would need to be replaced in full with correct falls. Several of the gutters were filled with leaves and other debris, which will impact negatively on their efficiency.





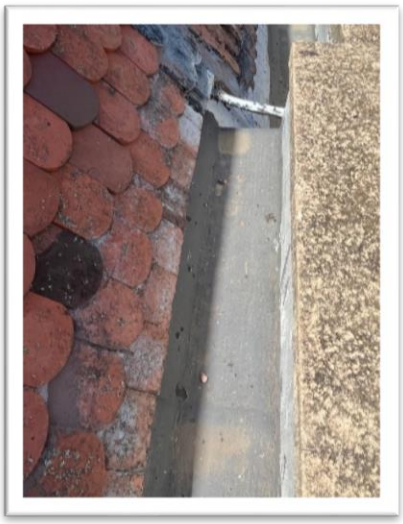


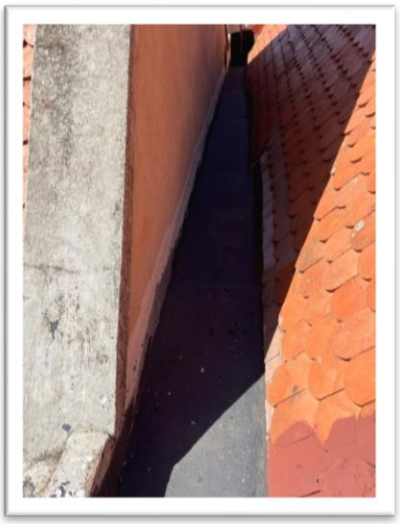


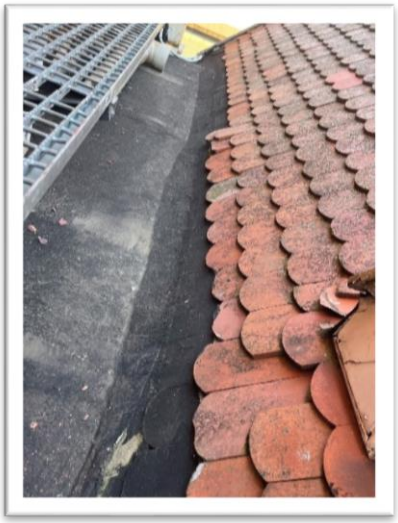


Structural failure of a number of these gutters can be attributed to the failure of the timber fascia they are fixed to, where the fascia have rotted or pulled away from their support structure.

In other instances, the roof overhangs are not sufficient enough to discharge water into the gutter, which would result in water ingress into the building.





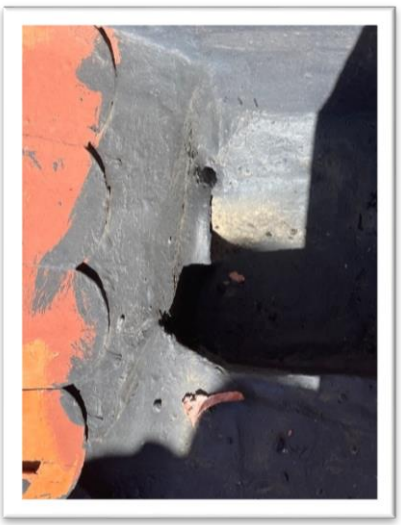


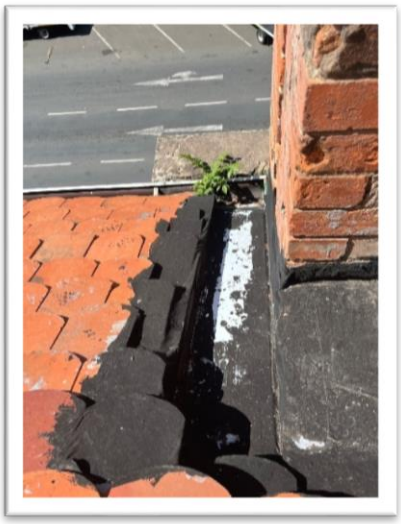
Gutters Proposed Recommendations:

- Eave gutters require cleaning of all debris and silt build-up, this will unblock gutters and let the flow of water run freely.
- Gutters to be inspected for replacement. Damaged/ bent/ twisted gutters to be removed and replaced with new. Gutter to be sheet metal and profile to match that of existing.
- Damaged and rotten timber fascia boards to be removed and replaced with new, to match existing in size and profile. Must be fully painted before gutters are fitted.
- Roof finish overhang into gutters to be adequate in size, where short on tiled roof; new tiles to be fitted and cut back to correct overhang size. Tiles to match existing roof tiles.

- BOX GUTTERS

  The box gutters fitted to the building appear to be the major source of water leaks to the inside of the building. The box gutters appear to be structurally in good condition, but in most instances, the waterproofing applied to the box gutters is failing at the joints with brickwork, roof edges and parapets, causing leaks. There is also evidence of leaves and debris collecting in some box gutters.



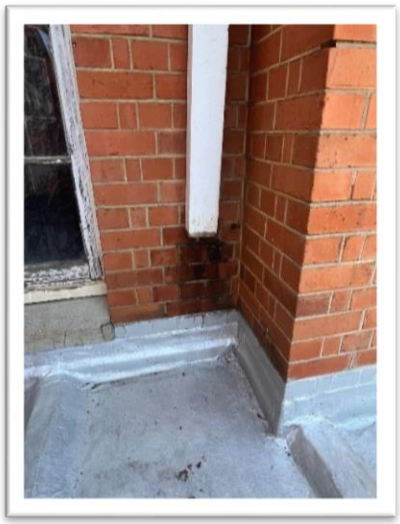


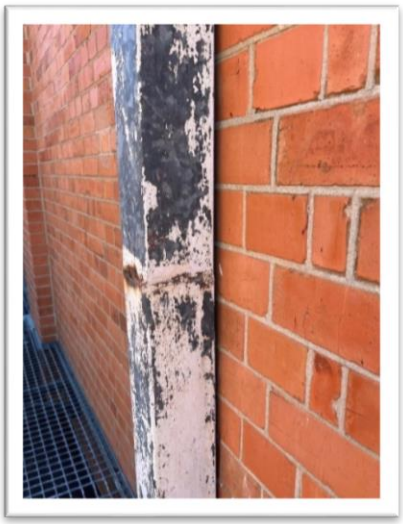
Box Gutters Proposed Recommendations:

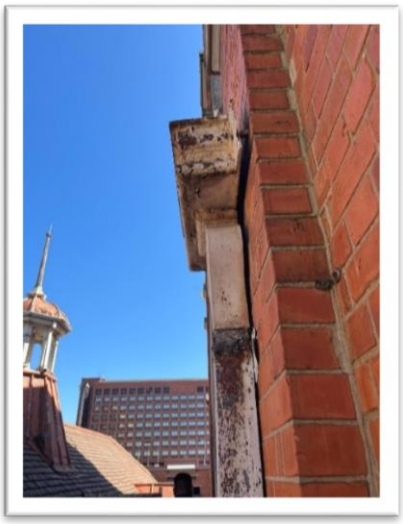
- Box gutters to be cleaned of all debris silt build-up, this will allow free flow of water to the outlets as well as eliminate pooling water issues.
- Box gutter waterproof membrane to be removed, gutter structure to be inspected and fully repaired/ replaced where required. Roof riles/ roof sheets would need to be lifted in these areas to properly inspect and repair the gutter.
- Box gutter to be fully waterproofed with new monolithic type sealant 3-4mm thick, to create new watertight gutter.
- New bent soaker sheet to be fitted under roof finish and into box gutter, using sheet metal.
- Roof finish to be reinstated, where necessary the roof finish must be replaced or added to so as to create an adequate overhang into the gutter.

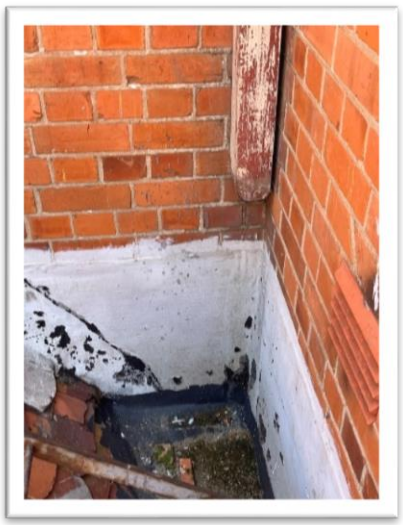
- DOWNPIPES

The building was originally fitted with cast-iron type downpipes, of which a large number have been replaced over the years with aluminium type downpipes of similar size. Almost all remaining downpipes are in a severe state and/ or coming loose at the joints and fixing brackets, resulting in water not being directed efficiently to the ground.









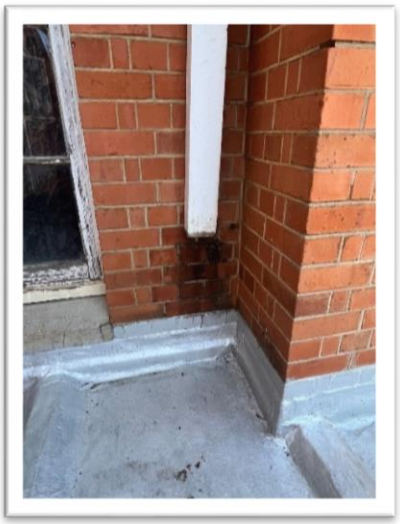
Downpipes Proposed Recommendations:

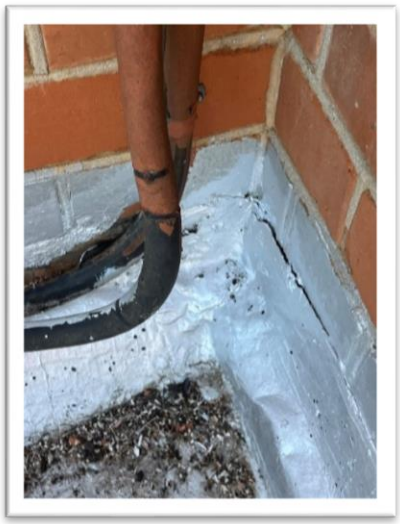
- All degraded downpipes to be repaired where possible, by weld/ brazing holes closed. Where holes are too big, then a closing plate cut to size is to be weld/ brazed into place.
- Downpipes to be fully cleaned and sanded down, prepared for new paint.
- Missing downpipe shoe to be fitted where missing, without the shoe the water is not directed away from the building.
- All downpipe brackets to be fixed onto the wall securely. At pipe joins, the bracket to be removed and join to be re-established before securing bracket to wall.
- Hopper heads of downpipes to be repaired as per downpipes above, once repaired these need to be fixed onto the wall securely.
- Downpipes to be reconnected to hopper heads, where spigot from hopper head into downpipe is missing they are to be remade and fitted, so pipe can fix over it.
- Downpipes to be reconnected to gutters, where spigot from gutter into downpipe is missing they are to be remade and fitted, so pipe can fix over it.
- Downpipes which are discharging onto lower roofs must have spreaders fabricated and fitted onto existing shoe.

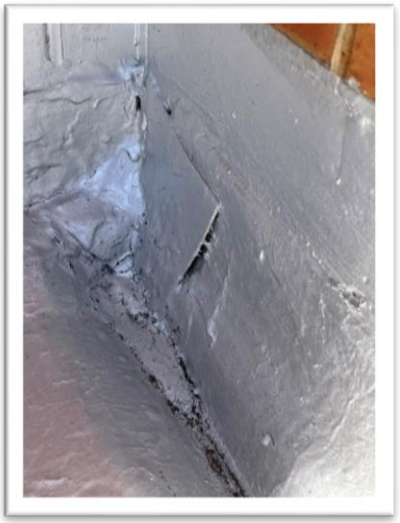
2.3 WATERPROOFING

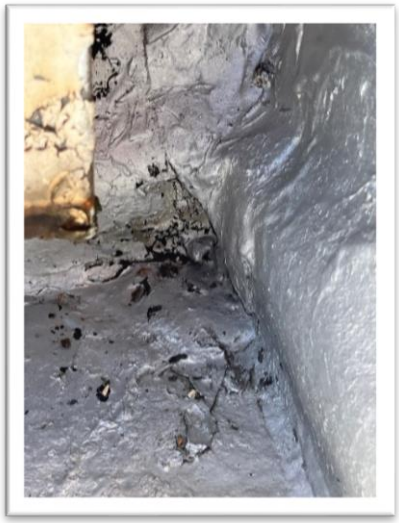
- FLAT ROOFS

The condition of the bitumen waterproofing on the concrete and timber flat roofs is poor. It appears that the waterproofing was recently re-painted in an attempt to improve its performance, but the paint's function is to protect the waterproofing and not to improve its performance, hence the problem has not been addressed. The major source of leaks from the flat roofs is at the flashing & counterflashing intersections, overlap joints, and in corners to parapet walls, etc.







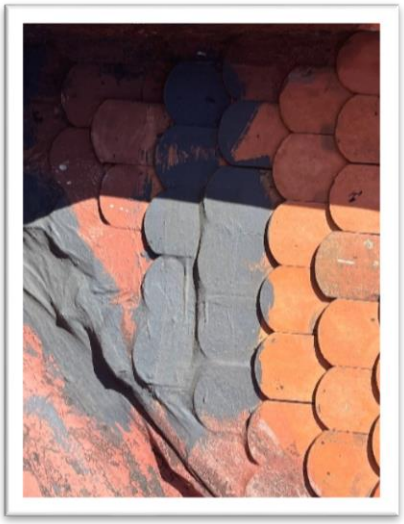


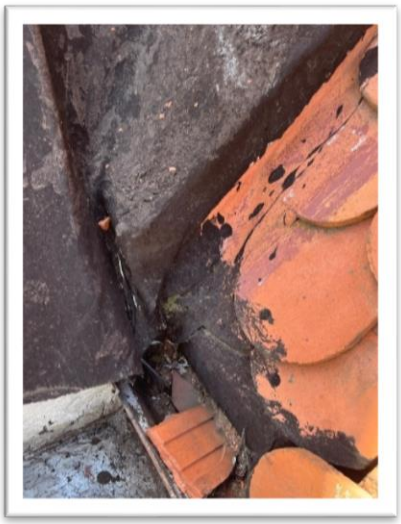
Flat Roofs Proposed Recommendations:

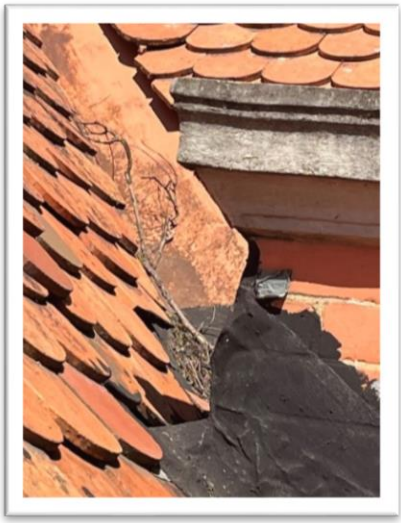
- Existing waterproofing to be removed in full from all flat roofs, including the flashing and counter flashing on the walls.
- Inspect all structure of flat roof, and repair when required. Roofs are either concrete or timber construction.
  It is advised that any ridges or unnecessary protrusions be removed as they make waterproofing more difficult.
- All corners where flat roof meets wall are to have 45° chamfers added, either as screed (concrete) or timber pieces (timber).
- Full monolithic type waterproof coating 3-4mm thick. This should rise up the walls by at least 250mm (or above highest drainage outlet).
  The wall rise should have a bent sheet metal counter flashing fitted of the join, this flashing to be cut into wall and sealed.

- VALLEYS

  Almost all valleys and remedial waterproofing to same needs to be addressed. It appears that the metal valleys have been waterproofed numerous times over the years, with a majority of the applications not following the original correct method. This leads to waterproofing membrane being applied over the edge tiles into the valley, allowing water to ingress behind the roof tiles and not into the valley. In several instances damaged side wall and counter flashings were observed.





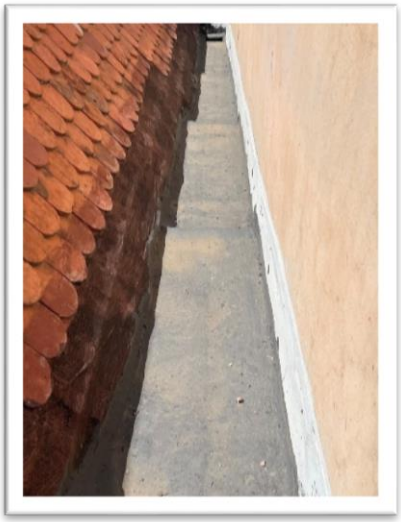


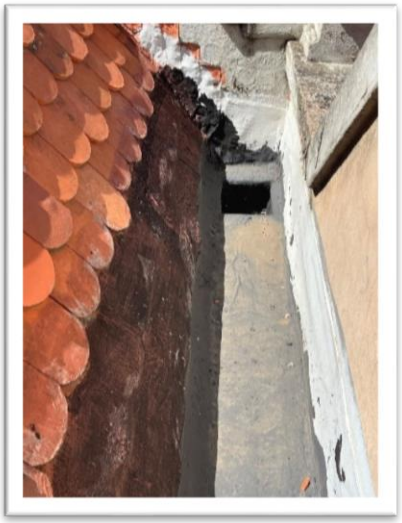
- HIPS & RIDGES

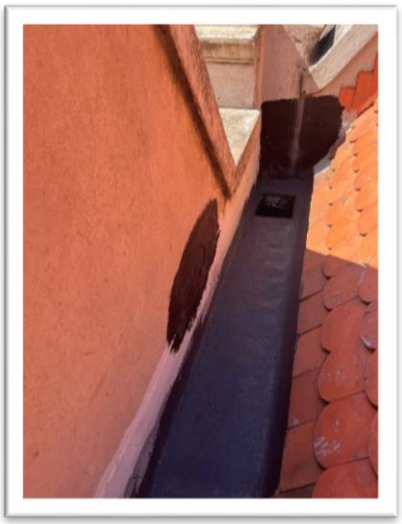
  Hip and ridge tiles are generally in descent condition, with only a couple of loose capping tiles that require re-fixing. These loose capping's will allow water to ingress into the roof space and behind the roof tiles, causing damage to these internal spaces.

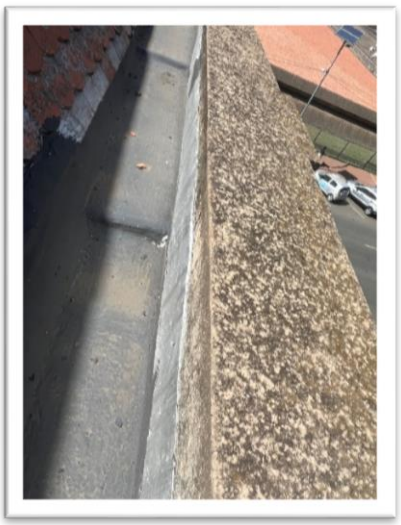
- BOX GUTTERS

  Waterproofing in all box gutters should be redone in the correct manner, with all counter and soaker flashing correctly installed. The current waterproofing installation was not properly executed to a large degree, is not properly lined, and is also showing signs of failure in many areas.







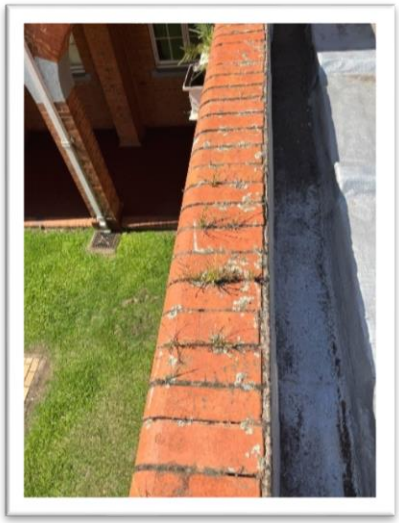


- COPINGS, CRACKS AND MORTAR JOINTS

  Copings on plastered and face brick parapet walls and gables require attention. In a number of instances, the plaster providing the waterproofing to the top and sides of the parapet walls is failing, allowing water seepage into the walls. This over time will exaggerate the peeling of the remainder plaster and result in water seeping into the wall itself, which will manifest as damp. There is also evidence of weeds growing out of the cracks in walls because of wall dampness. Damaged face brick and missing mortar joints are evident in areas, which also allows water seepage over time into the wall cavity.





Copings, Cracks and Mortar Joints Proposed Recommendations:

- Copings on all parapet walls to have all cracks and chips repaired with non-shrink grout, copings to be fully prepared for new paint.
- Severely damaged/ cracked copings to be chopped out in sections, new copings to be cast into place (to match existing profile). Plaster to be non-shrink with waterproof additive and glass fibre reinforced mixture.
- Paint to be the mastic type waterproof paint, to match the existing cement grey colour.
- Damaged/ crumbling mortar joints to be raked out to point of being dry. These joints must be repaired by filling them with a non-shrink grouting, which has a waterproof admixture.
- Where possible, it is advised that the degraded/ cracked/ broken bricks be removed and replaced with new to match existing. Priority will be to find old stock bricks to use.

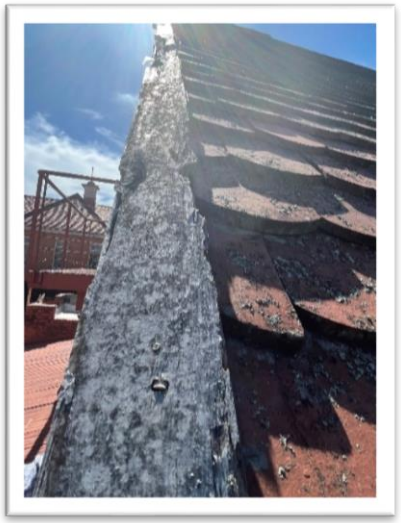
2.4 OTHER ARCHITECTURAL ELEMENTS

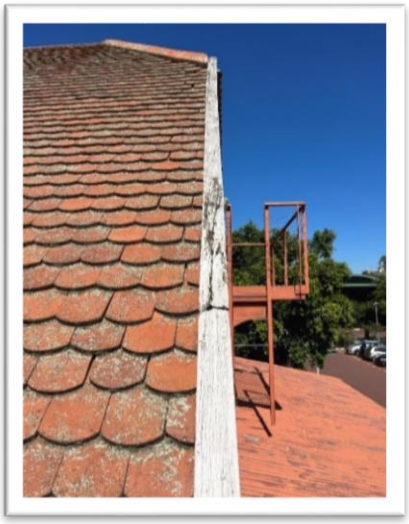
- TURRETS and DORMERS

The timber turrets on the roof require extensive restoration, as the timber elements of these structures have failed. This too presents a risk of collapse. The dormer metal roof sheets require maintenance, as the sheets have started to separate from each other. The timber structures within the dormer face have deteriorated severely and require repair/ replacement. The timber louvres in these structures are broken in places, directly allowing rainwater to penetrate the roof space and ceilings below.

- TIMBER BARGE BOARD AND FASCIAS

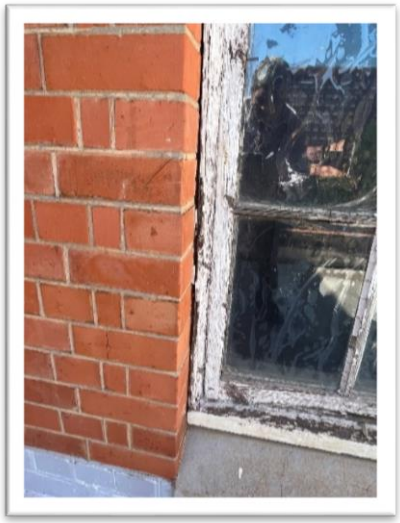
  The timber barge boards and fascia's require repair/ replacement. In a number of instances, the fascia itself has rotten and is no longer considered to be structural. These fascia's are coming away from its support structures, which would indicate possible damage to the support structure as well.

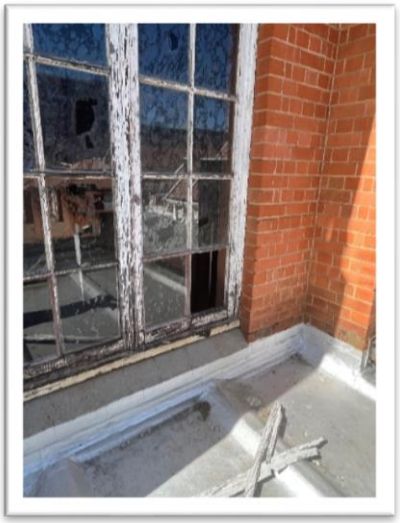


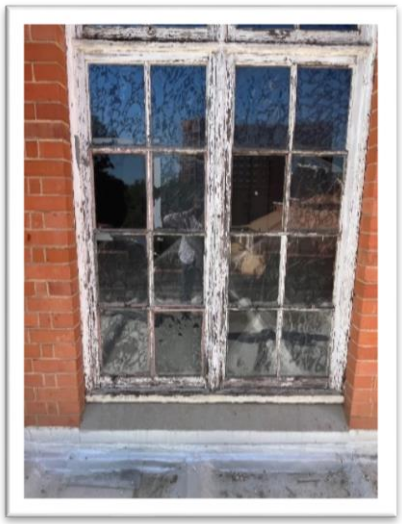


- TIMBER WINDOWS

  There are several timber windows that have deteriorated quite severely over time, possibly due to lack of maintenance and exposure to the elements. These windows are no longer waterproof and allow water to directly penetrate the wall cavity and interior of the building.





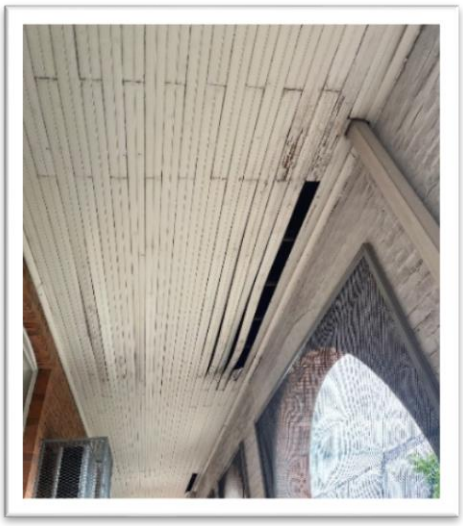


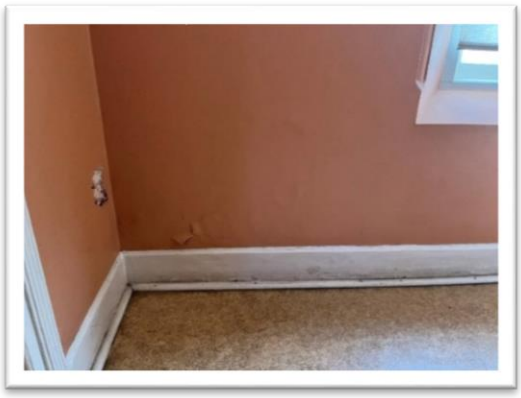
Timber Windows Proposed Recommendations:

- Damaged and broken timber windows to be removed and repaired. All work to be carried out by approved carpenter.
  New timber frames, transoms/ mullions and beading to be fabricated to match existing exactly where required, using approved hardwood (saligna/ meranti).
- Repaired timber windows to be fully prepared and painted, prior to being refitted into openings.
- Gaps between walls and window frames are to be fully sealed with an acrylic type watertight sealant, internally and externally.
- Missing and broken glass panes to be replaced with new.
  Existing putty to be removed from windows and new putty to be applied for all windows.

- CEILINGS AND INTERNAL WALLS

  Due to the prolonged water ingress from the leaks identified, the ceiling and internal wall plaster of the building have been damaged in several areas. Damp is evident in the internal walls and signs of water damage on several ceilings throughout the building. Once the external leaks have been successfully addressed, the interior elements can be safely repaired/ replaced in accordance with AMAFA guidelines.





Internal Walls & Ceilings Proposed Recommendations:

- All internal walls and ceilings that have been damaged due to water ingress must be fully prepared for new paint; scraping, sanding, filling and re-sanding.
- Where ceilings are damaged, they must be replaced in sections. The existing cornice must be removed and kept safe (if still usable).
  New cornice and mouldings must be made, to match the existing exactly, when replacement is required.
- Surfaces to be painted once all is fully repaired.

(the internal work is only to be executed once all external work and leaks are completed and repaired)

3. CONCLUSION

The extend of the damages to the building as a result of the failing waterproofing and other problems identified in this report, require all remedial actions recommended to be treated as high priority items, to avoid further damage to the buildings and risk of collapse of specific items such as the turrets, dormers, fascia's and ceilings.

All the proposed recommendations will require full detailing and specifications for submission to AMAFA so that a permit may be obtained to carry out the works.

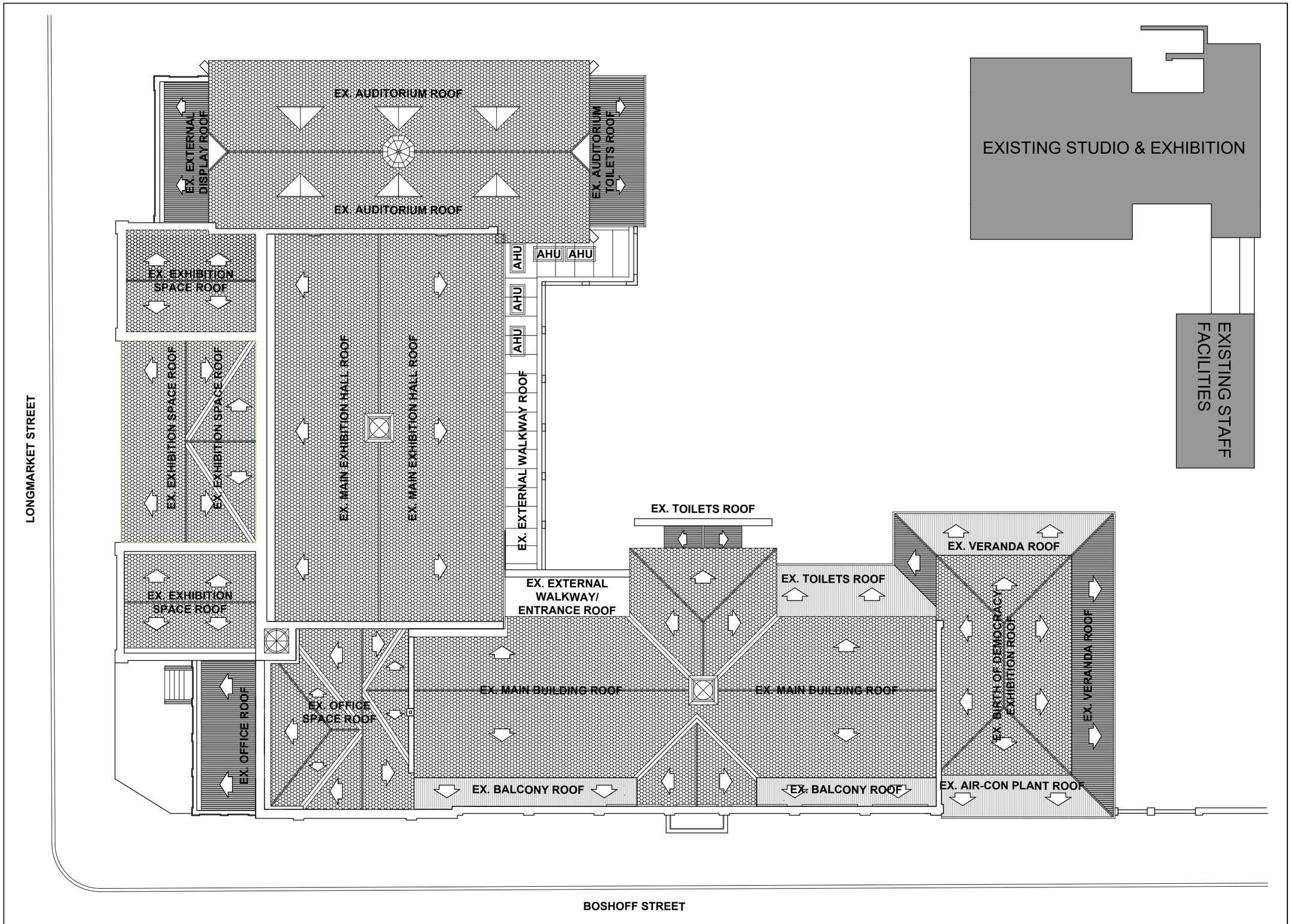
--- o ---

Prepared by:

_____

Mr. JA Meintjes Pr. Arch.

ANNEXURE A



ROOF - EXISTING LAYOUT