

## **Waterproofing of roofs to Collegiate Parish Church of St Paul's Shipwreck**

### *Preamble*

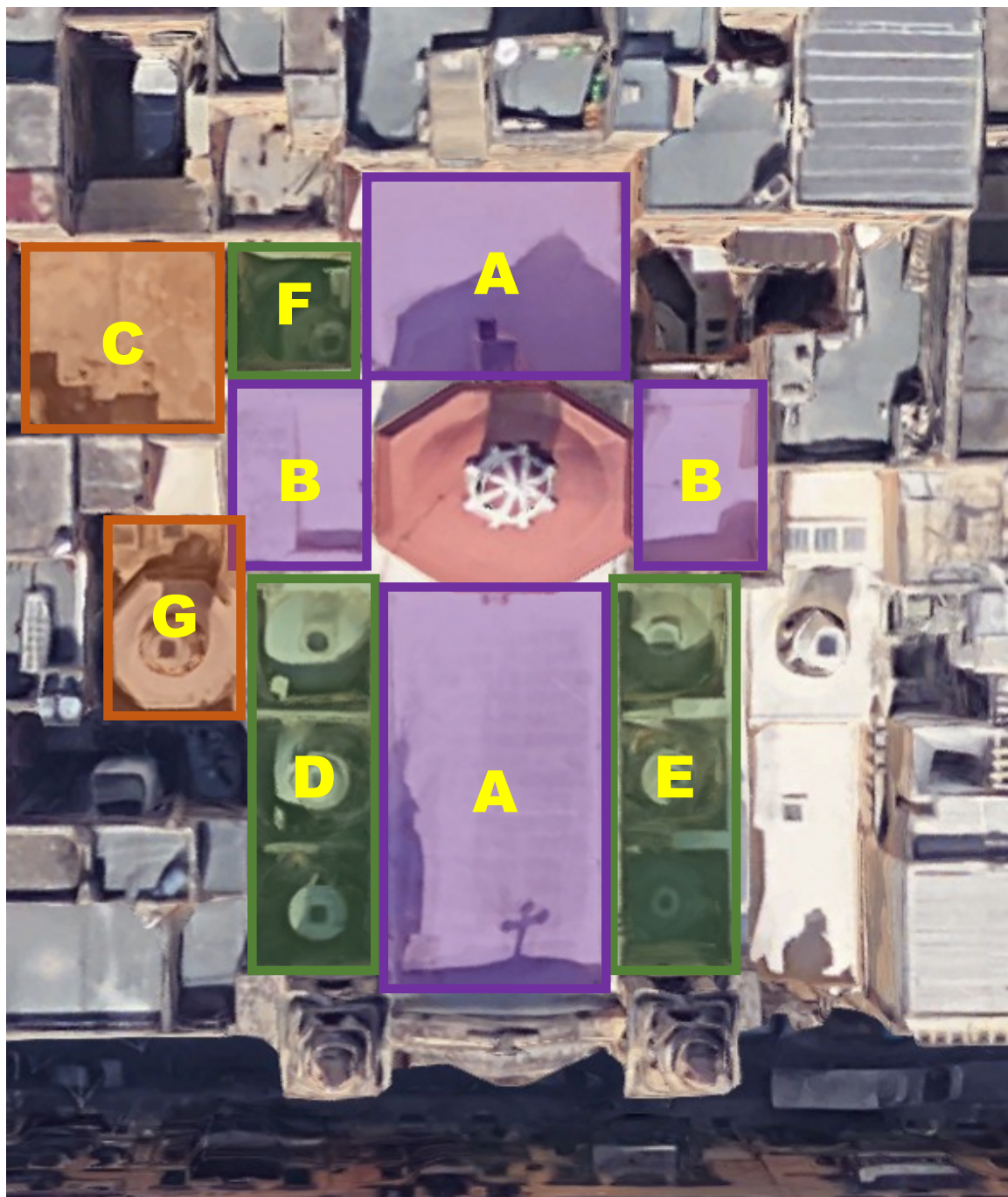
I have been requested by the Archpriest of the Collegiate Parish Church of St Paul's Shipwreck in Valletta to check the condition of the waterproofing at roof level. I have visited the roofs on several occasions in April and May 2020 to gather the necessary information. The principal scope of the report is to ensure that the existing waterproofing of roofs is adequate enough prior to proceeding with the restoration of the underlying frescoed ceiling and dome paintings. Any ancillary works are to be listed to ensure that no water infiltration occurs into the church from any external source.

The areas visited which are being proposed for the works are the following:

- Barrel vaulted roof over the main aisle and choir (A)
- Roof over St. Cajetan and St. Joseph's chapel (B)
- Adjacent flat roof over the church decoration stores and sacristies (C)
- Domes to the left hand side of the church above the chapel of Archangel St. Michael, chapel of St. Crispin and St. Crispinian, outer dome of the chapel of the Blessed Sacrament (D)
- Domes to the right hand side of the church above the chapel of St. Martin, chapel of St. Homobonus, outer dome of the chapel of Our Lady of Charity (E)
- Roof over chapel of the Crucifix (F)
- Dome over the chapel of the Blessed Sacrament and adjacent area (G)

The main cupola, the roof over the Oratory and that over the chapel of Our Lady of Charity are not in the scope of this report.

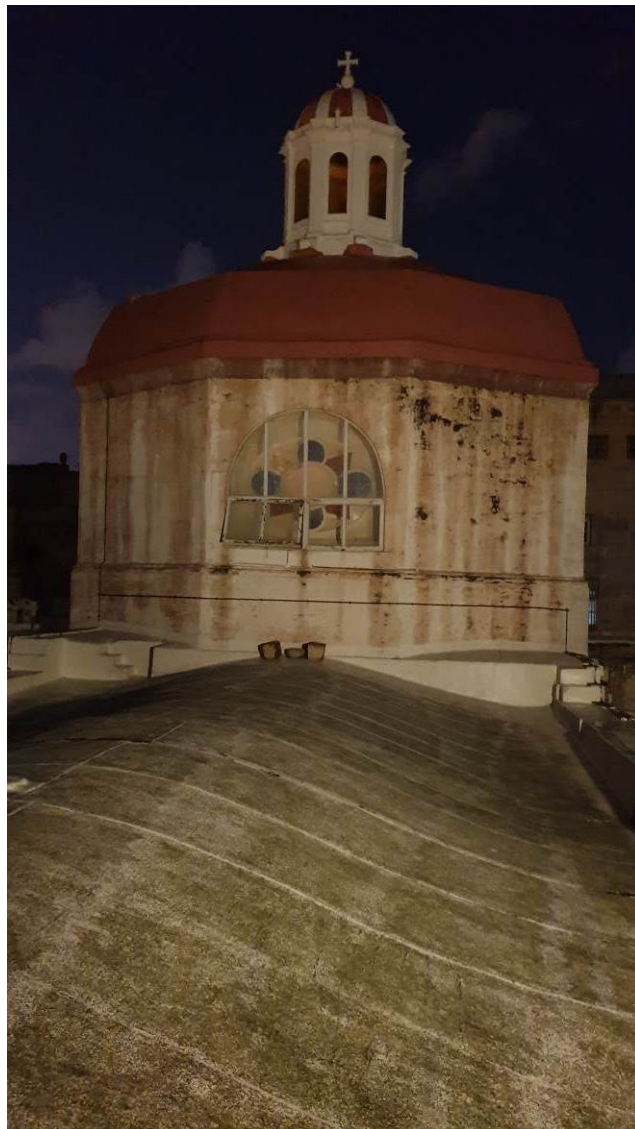
Access to the roof over the main aisle is through a spiral staircase close to the façade. The same staircase provides access to the domes on the left and right hand side. Access to the roof over the chapel of the Crucifix is located through the Oratory of the Blessed Sacrament via a narrow entry and spiral staircase. The roof and cupola of the Blessed Sacrament's chapel are accessed from the main spiral staircase to the decoration stores.



### *Current Condition*

- **Barrel vaulted roof over the main aisle and choir**

The existing membrane is of the bituminous torch welded type with solar protection quartz and was installed around 20 years ago. The membrane was painted with a white paint coating as protection and to help in reducing the solar absorbance. This coating has deteriorated and a darker part of the membrane is now being exposed. In some areas it was noted that the membrane is not attached any more to the substrate and would thus easily detach during heavy winds. It should also be remarked that such membranes have a life span of between 15 to 20 years unless protected with some form of screed. The possibility of cracking especially in between the joints and allowing water to ingress in the coming years is growing.



- **Roof over St. Cajetan and St. Joseph's chapel**

These have been waterproofed in the same period and with the same typology as the main aisle. Similarly, deterioration of the protective paint was noted though since they are installed on smaller areas, no particular issues could be noted. On the right hand side of the main cupola, it was noticed that a top part of a buttress wall has exposed old deffun rendering which was never waterproofed and has extensive cracks in the top probably cause by vegetation. Any water seeping through these cracks might seep towards the church's decorated interiors.







- **Adjacent flat roof over the church decoration stores and sacristies**

These areas seen to still have the old deffun waterproofing installed with various layers of cement washes and paints which are not effective anymore. These areas also seem to have poor falls and are not smooth with the growth of lichens and moss. An existing skylight was noticed and seems to be temporarily covered as it was reportedly leaking into the underlying church decoration stores.



- **Domes to the right hand side of the church above the chapel of St. Martin, chapel of St. Homobonus, outer dome of the chapel of Our Lady of Charity**

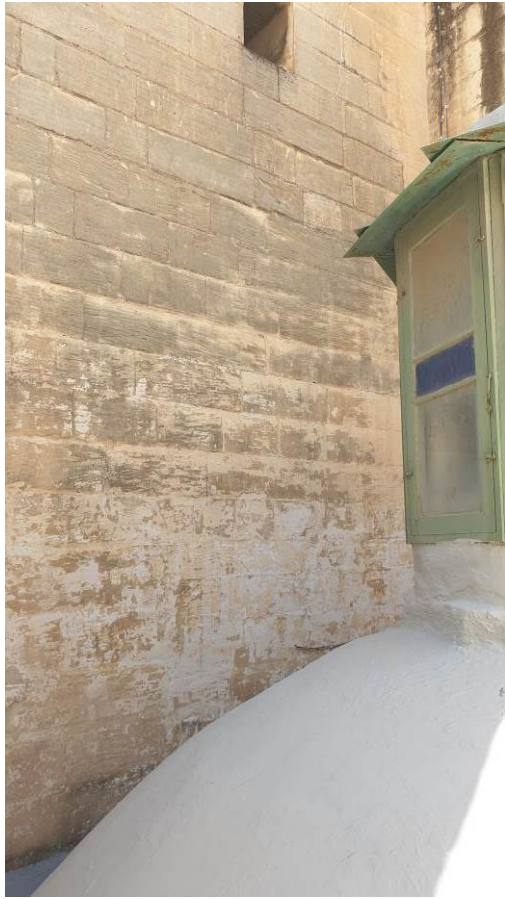
These domes are of various shapes and sizes and are located in between buttress walls supporting the main aisle barrel vault. The waterproofing and condition also varies from one area to another. The dome above St. Martin's chapel has been probably painted with a roof compound though due to the material's poor elasticity, it has cracked in locations which show regular external movement. The dome above the chapel of St. Homobonus has a cement based liquid membrane application which is protected from solar radiation with a coloured paint. Narrow canals for the passage of water are present in this area. As for the outer chapel of Our Lady of Charity, the waterproofing seems to be made out of a thin layer of netting with an overlying bituminous coating and silver paint. This is detached in certain areas and also has sparse vegetation growth in cracks in the floor and sides.

All surrounding walls have an uneven texture where in some places the pointing is missing or has deteriorated together with the adjacent stone. Only few locations with heavy stone deterioration were noted.

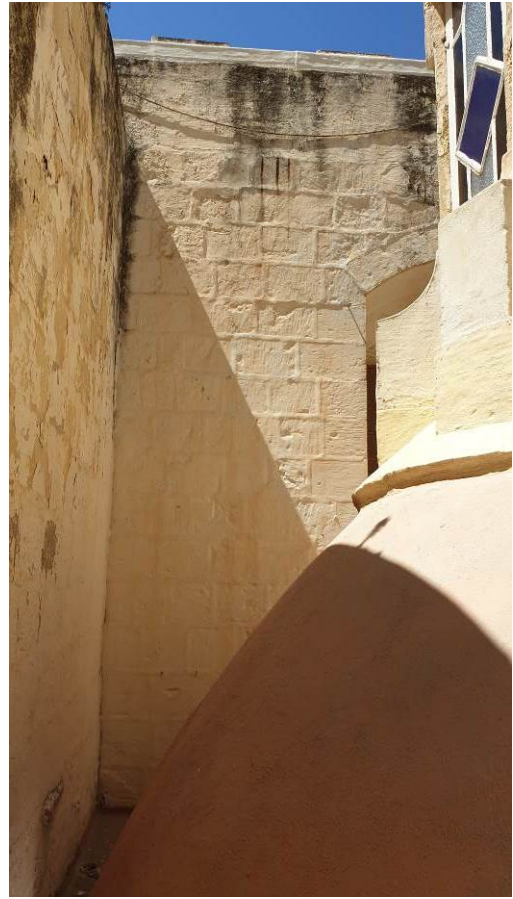
Cupola windows seem to be in a good condition though they would require some maintenance. It should be pointed out that the windows do not seem to completely seal the surroundings thus might allow water ingress during heavy rain. The dome of the chapel of Our Lady of Charity has a glass skylight instead of windows.

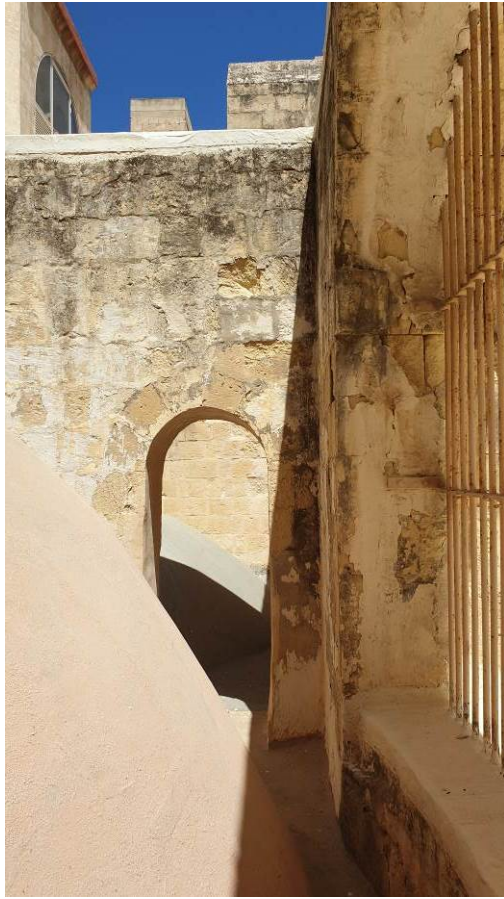
At the end of the watercourse in the area above the chapel of St. Martin, a pipe exists to gather water and drain it at street level. It seems that some leak is present since the painted pendentive beneath the said pipe is heavily damaged by water infiltration.

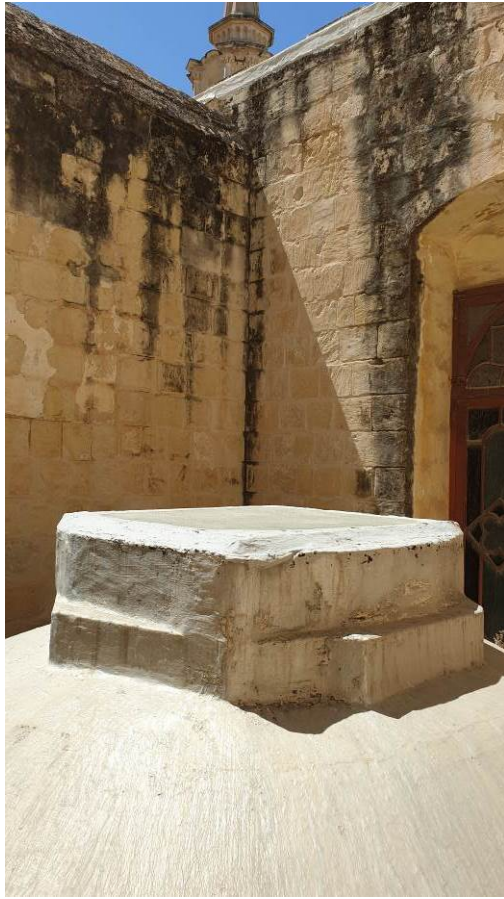












- **Domes to the left hand side of the church above the chapel of Archangel St. Michael, chapel of St. Crispin and St. Crispinian, outer dome of the chapel of the Blessed Sacrament**

Two of these domes have similar shapes though the outer dome of the chapel of the Blessed Sacrament is of a smaller shape. They are located in between buttress walls supporting the main aisle barrel vault. The waterproofing for all of these is fairly similar and consist of a thin layer of netting with an overlying bituminous coating and silver paint. This is detached in certain areas and allows the growth of vegetation in cracks.

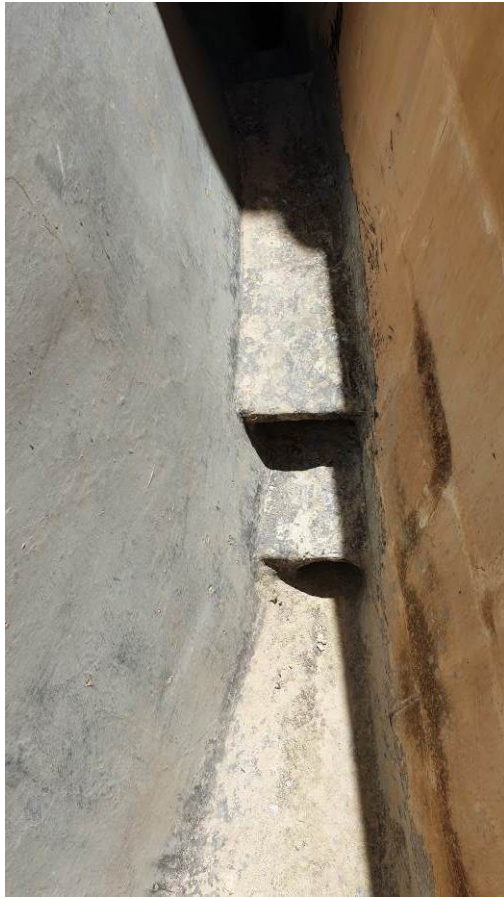
A number of walls in this area have heavily deteriorated blocks from which even the existing waterproofing has detached. Several locations with missing pointing exist.

Cupola windows are not in a good condition and exhibit areas with wood rot and broken glass. These windows do not seem to completely seal the surroundings thus might allow water ingress during heavy rain. The outer dome of the chapel of the blessed sacrament has a broken glass skylight which is covered with a corrugated polycarbonate sheet.

Most of the watercourses are narrow and have to be cleaned regularly to allow water to run through easily.























- **Roof over chapel of the Crucifix**

This area has been painted with a roof compound. Some of the paint has deteriorated. Furthermore, this area is prone to falling debris from a highly deteriorated wall belonging to a neighbouring third party whom we are in contact with to get it repaired. The surrounding walls contain some stones which are deteriorating and require replacement. Pointing is required in some sections.



- **Dome over the chapel of the Blessed Sacrament and adjacent area**

The dome has been painted with a roof compound which shows signs of flaking and thus is not performing its function adequately. The lantern's pilasters do not seem to have been protected recently and have exposed stone and joints in certain zones. Note that these blocks are fairly thin and the migration of damp to the decorated interior is highly possible. The sides of the cupola have not been waterproofed have exposed stone covered with lichens. This might easily be a source of water infiltration. The surrounding area which is also a watercourse, still exhibits the exposed deffun and requires adequate protection. Sparse vegetation growth in these areas noted.





### *Proposed Works*

Works shall vary by location though the final typology should be similar. A list of works is available in point form for each area below. The eventual contractor shall provide the following with his submission for approval:

- Technical datasheet
- Details for joints on large roofs
- Details for connections in pipes
- Details for air vents
- Sample guarantee
- Local case studies
- Maintenance program

The material proposed can be cement based or polyurethane based and shall have a minimum guarantee period of 10 years and a minimum working life time of 25 years. The contractor has to understand that the rates provided shall be adequate for the conditions existing on site and access limitations.

The following minimum performance specifications are required for the waterproofing material proposed to EN1504-2:

Colors: light colored, ideally finished product is white

Tensile strength:  $> 2 \text{ N/mm}^2$

Water impermeability: 150 KPa

Expected working life: W3 (25 years)

Climatic zone: S (Severe)

User load: P2 Moderate Accessible for maintenance of the roofing only

Adhesion:  $\geq 0.8 \text{ N/mm}^2$

Artificial weathering: Pass

Reaction to fire: Euroclass F

Crack ability bridging: A4

### Requirements per zone

- **Barrel vaulted roof over the main aisle and choir (A)**

The membrane in this area shall be removed followed by the application of a new liquid membrane in various layers and including required air vents and drain connection detail.

- **Roof over St. Cajetan and St. Joseph's chapel (B)**

- The membrane in this area shall be removed followed by the application of a new liquid membrane in various layers and including required air vents and drain connection detail. The adjoining exposed buttress wall shall be pointed and waterproofing applied thereafter.

- **Adjacent flat roof over the church decoration stores and sacristies (C)**

The following sequence shall be adopted:

- Replacement of the existing skylight.
- Pointing of perimeter walls
- Cleaning of floors from any lichens and moss
- Repairs to the floors with approved materials.
- Application of liquid membrane in various layers and including required air vents and drain connection detail.

- **Domes to the left hand side of the church above the chapel of Archangel St. Michael, chapel of St. Crispin and St. Crispinian, outer dome of the chapel of the Blessed Sacrament (D)**

The following sequence shall be followed:

- Replacement of deteriorated stone blocks and pointing of all perimeter walls using stone coloured hydraulic lime.
- Replacement of timber windows with new windows constructed from low maintenance materials. Each cupola to have two openable windows with the remaining windows to be fixed and sealed.
- Remove of all existing waterproofing on surfaces.
- Perform repairs to loose or broken surfaces using approved materials.

- Application of liquid membrane in various layers including required drain connection detail.
- **Domes to the right hand side of the church above the chapel of St. Martin, chapel of St. Homobonus, outer dome of the chapel of Our Lady of Charity (E)**

The following sequence shall be followed:

- Replacement of deteriorated stone blocks and pointing of all perimeter walls using stone coloured hydraulic lime.
  - Breaking of existing embedded rain water pipe and replacement with new heavy duty PVC pipe.
  - Replacement of timber windows with new windows might be avoided though one has to proceed with sealing of existing windows.
  - Remove of all existing waterproofing on surfaces of St. Martin's chapel dome and that over the outer cupola for the chapel of Our Lady of Charity.
  - Perform repairs to loose or broken surfaces using approved materials.
  - Application of liquid membrane in various layers including required drain connection detail. Special attention to be provided to the connecting to the existing liquid membrane above St. Homobonus chapel.
  - The dome over St. Homobonus chapel requires to have a new solar protection coating to the existing in the form as proposed by the contractor and accepted by the project architect.
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- **Roof over chapel of the Crucifix (F) & Dome over the chapel of the Blessed Sacrament and adjacent area (G)**

Works shall be carried out as follows:

- Replacement of deteriorated stone blocks and pointing of all perimeter walls using stone coloured hydraulic lime.
- Proposed replacement of windows on the chapel of the Blessed Sacrament

- Remove of all existing waterproofing on surfaces.
- Perform repairs to loose or broken surfaces using approved materials.
- Application of liquid membrane in various layers including required drain connection detail.