Structural Assessment Report (Stage 2)
of
St Georges Leisure Centre
221 The Highway
London E1W 3BP
For
London Borough of Tower Hamlets

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INDEX

1.0 INSTRUCTIONS & SCOPE

2.0 EXISTING STRUCTURE

3.0 SITE OBSERVATIONS – INTERNALLY

4.0 SITE OBSERVATIONS – EXTERNALLY

5.0 REVIEW & CONCLUSIONS

6.0 SUMMARY

7.0 LIMITATIONS

1.0 INSTRUCTIONS & SCOPE

We were instructed by Simon McIntyre of the London borough of Tower Hamlets to attend site and provide a structural assessment on the structural elements of the building, attention to the tiling and windows to the external elevations and the internal galleries around the pool.

Nick Snow of Chamberlain Consulting LLP visited site on the 21st August 2018 to carry out a review of the building. This assessment is based on visual observations and together with concrete sampling in a number of areas. External access was gained by way of a Cherry Picker. Intrusive investigations were carried out for the internal and external concrete investigations only. Structural internal elements concerning the galleries were viewed from ground level and other accessible vantage points.

2.0 EXISTING STRUCTURE

The existing building is an insitu reinforced concrete framed structure built in the late 1960's - early 1970's, and has two swimming pools, the main pool being suspended over the reinforced concrete basement plantroom. The ground floor appears to be solid insitu concrete, and it is assumed that the upper gallery floors around the pool enclosure at 1st and 2nd floor levels are of similar construction.
The roof structures are unknown but in one location steel “Hyrib” type soffit was evident, this being used as a permanent formwork/reinforcement to the perimeter, the main pool roof most probably being a concrete shell.

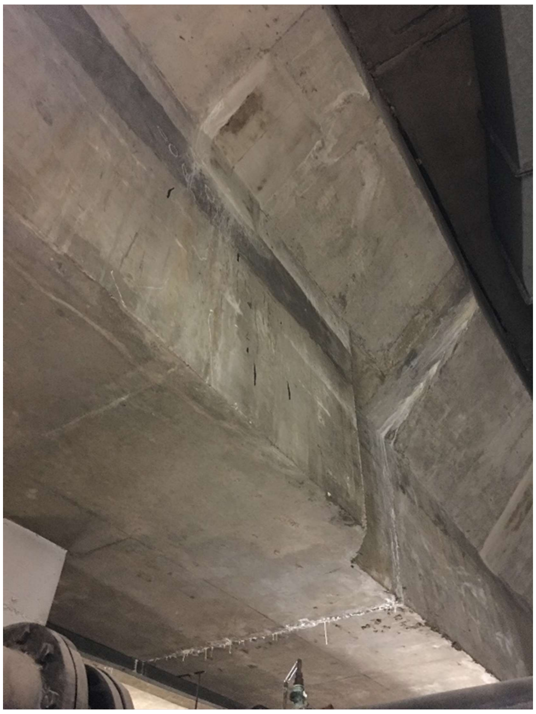
External elevations have continuous band windows to the main pool hall with reinforced concrete upstand spandrel walls externally faced with mosaic tiles and internally lined with woodwool slabs. The single storey section of the building containing the small pool is brickwork with isolated windows as is the ground floor storey to the main pool block fronting The Highway.

3.0 SITE OBERVATIONS

3.1 Internally

3.1.1 Basement Plantroom below Main Pool This area remains the same condition from our previous report issued on the 20th of April 2017 - A copy can be located at the end of this assessment. It is effectively a reinforced concrete box structure with a series of isolated columns supporting the suspended ground floor and main pool structure over. In reviewing the existing it is clear that there is minor seepage of pool water through the original construction joints.
The warm and relatively damp environment in the space and the use of aggressive pool chemical treatments, has resulted in spalling of the concrete and rusting of reinforcement, due to the poor control of concrete cover leading to insufficient protection to the embedded steel

reinforcement. This is particularly evident to a number of columns where previous poor-quality repairs have be carried out, this also being identified in several of the previous reports.

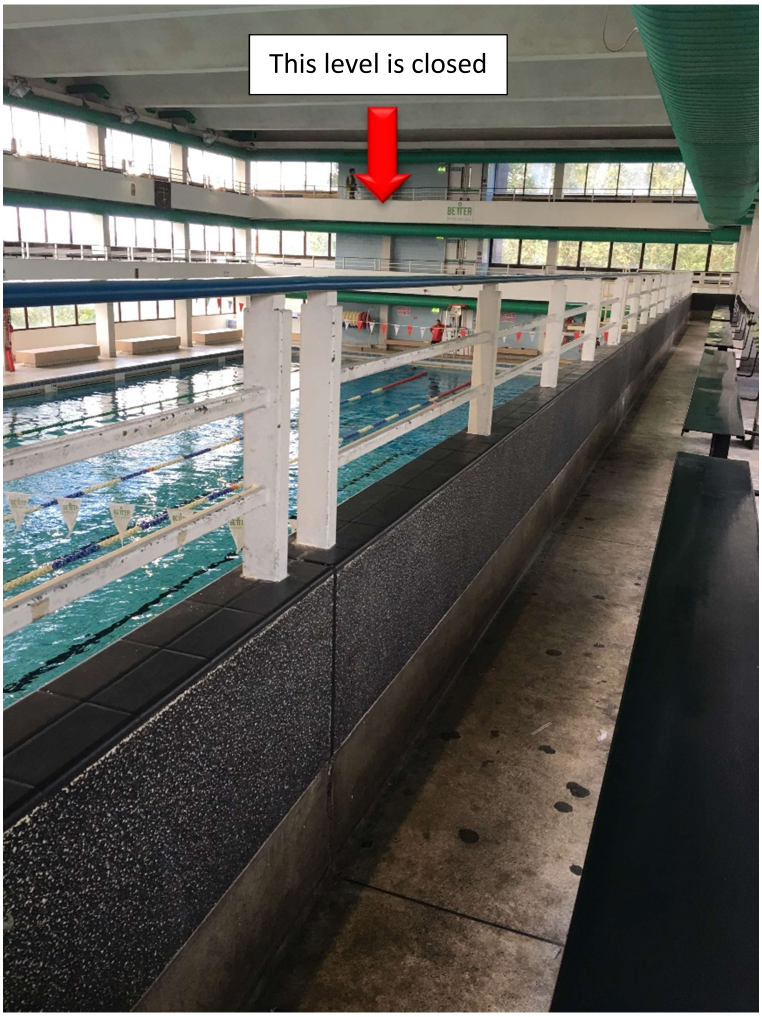


Examples of water seepage through original construction joints

Examples of previous poor-quality concrete repairs to columns. In the photo on the left it is clear there is a live water leak coming from ground floor pool hall level, the water following cracking in the previous concrete repair. This column is referenced TA1 in the Martech condition report carried out in 2007.

Close up view of the top of the column noted above shows no water leakage at the time of the assessment. However, there is evidence of a build-up of salts.

3.1.2 **Ground Floor – Main Pool Hall** This area remains the same condition from our previous report issued on the 20th of April 2017 – A copy can be located at the end of this assessment. This is a large single space with viewing galleries at the first and second floor levels, the later having been closed off for a number of years due to Health and Safety concerns (Note, closed prior to 2003 report).



View of Main Pool Hall

Pool level is generally in fair condition with regular upkeep of the walls and floors carried out. There is little to comment on structurally on this level as all structural elements are effectively covered.

3.1.3 First Floor – Main Pool Hall Viewing Gallery

The first-floor level gallery is in fair condition with the internal faces of the walls lined with a board material and decorated in some areas. There were signs of repair works on the ceilings and evidence of wall boarding being removed as shown below:

Typical views of Main Pool Hall spandrel wall and ceiling on the 1st floor level – See CCLLP Drawing 18003-201-R for locations.

3.1.4 **Second Floor – Main Pool Hall** At the second-floor gallery level - it is possible to see most of the structural elements particularly to the perimeter walls and ceiling as these has been exposed prior to the assessment. At this level all the original plaster wall finishes have been removed exposing wood wool lining to the concrete spandrel walls. This lining was we presume to act as insulation and was placed into the shutter prior to casting the concrete. In places this has been cut away exposing rusting embedded steel fixings, electrical conduits, etc. In addition, the interface at window cill level is exposed.

To the ceiling over the second floor gallery, large areas are affected by the humid interior environment of the pool hall. See below:

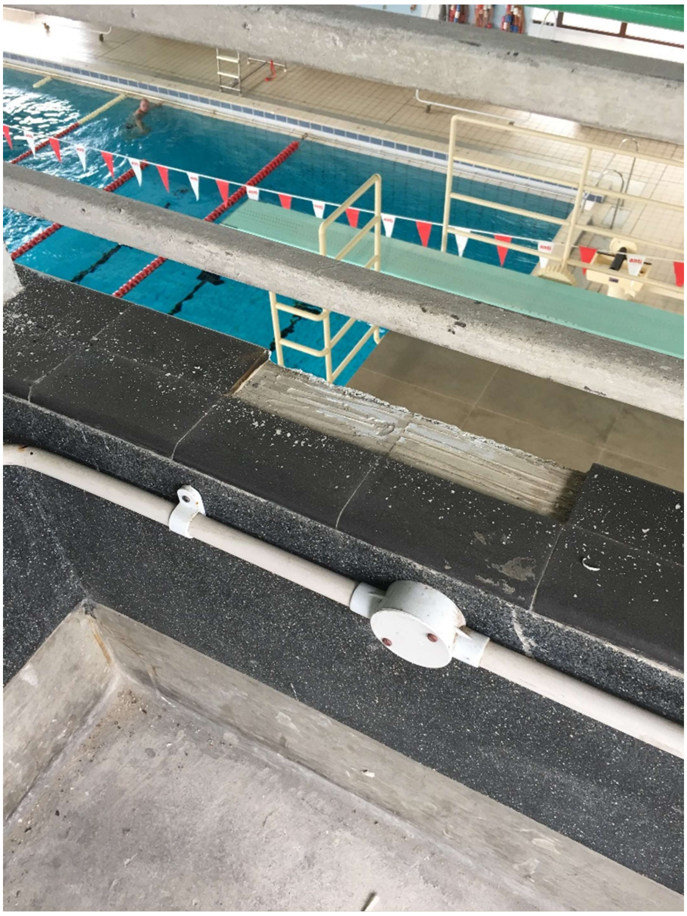
View above ceiling over 2nd floor gallery
It can be seen that the ceiling “Hyrib” roof slab reinforcement has extreme corrosion (arrowed).

View above ceiling over 2nd floor gallery
It can be seen that the slab reinforcement has extreme corrosion and is exposed (arrowed).

View above ceiling over 2nd floor gallery
It can be seen that the slab reinforcement has extreme corrosion and is exposed (arrowed). The slab has signs of major deterioration.

Typical views of Main Pool Hall spandrel wall 2nd floor level
Note: rusted electrical conduits and metal fixings in wall.

Close up view of wall window interface



Close up missing / broken tiles on the parapets
See CCLLP Drawing 18003-301-R for locations.

30No. concrete test samples were taken at this level – the results are shown below:

St. Georges Leisure Centre									
	Project: 7116	Determined Cement content=30.9%							
	Internal Summary					% Chloride by Mass of Cement		% Sulphate by mass of Cement	
Ref.	Location	Element	Carb depth (mm)	Cover horiz.	Cover vert.	5-30mm	30-55mm	5-30mm	30-55mm
TA1	2nd Floor Gallery	Ext. Wall	30					0.29	0.29
TA2	2nd Floor Gallery	Flr	14	Mesh?	57	0.27	0.18		
TA3	2nd Floor Gallery	Parapet Wall	12	37(20)	31(12)	0.11	0.11		
TA4	2nd Floor Gallery	Column	3	63	59(28)	0.11	0.07		
TA5	2nd Floor Gallery	Ext. Wall	7			0.09	0.05		
TA6	2nd Floor Gallery	Column	4	61	69			0.55	0.27
TA7	2nd Floor Gallery	Ext. Wall	4			0.05	0.05		
TA8	2nd Floor Gallery	Ext. Wall	0			0.12	0.06		
TA9	2nd Floor Gallery	Parapet Wall	2	31(20)	37(32)	0.07	0.02		
TA10	2nd Floor Gallery	Parapet Wall	28	51(20)	56(40)	0.09	<0.02		
TA11	2nd Floor Gallery	Column	14	74	58(40)	0.11	0.09		
TA12	2nd Floor Gallery	Floor	18	68(32)	65(25)			0.50	0.53
TA13	2nd Floor Gallery	Floor	9	63	77	0.15	0.18		
TA14	2nd Floor Gallery	Ext. Wall	2	62	45(12)	0.09	0.08		
TA15	2nd Floor Gallery	Column	2	54(16)	52(32)			0.50	0.52
TA16	2nd Floor Gallery	Ext. Wall	8			0.05	0.05		
TA17	2nd Floor Gallery	Parapet Wall	34	31(14)	41(22)			0.42	0.36
TA18	1st Floor Gallery	Ext. Wall Cill	0			0.05	0.05		
TA19	1st Floor Gallery	Ext. Wall	7					0.43	0.25
TA20	1st Floor Gallery	Floor	8	21	63			0.34	0.54
TA21	1st Floor Gallery	Column	0	50(14)	54(32)	0.11	0.12		

TA22	1st Floor Gallery	Parapet Wall	>55	49(32)	54(40)	0.23	0.05			
TA23	1st Floor Gallery	Floor	3	76	69	0.27	0.17			
TA24	2nd Floor Gallery	Floor	12			0.22	0.23			
TA25	2nd Floor Gallery	Ceiling Upper soffit	3	3 (spalled)				0.17	0.19	
TA26	2nd Floor Gallery	Ceiling Upper soffit	16			0.07	0.16			
TA27	2nd Floor Gallery	ceiling Lower soffit	3					0.37	0.36	
TA28	2nd Floor Gallery	ceiling Lower soffit	0			0.09	0.02			
TA29	2nd Floor Gallery	Internal wall roof	2	34	41	0.07	0.05			
TA30	2nd Floor Gallery	External wall roof	2	12				0.46	0.45	

There is evidence of Chloride within the walls and slabs which is a result to humidity from the pool area. The level is low – nothing greater than 0.3% which is low risk.

4.1 Externally

We carried out an intrusive survey with regards to concrete samples to the exterior of the building to visually assess the condition, cracking and any movement. The external faces are covered with a small mosaic tile which was commonly used as a finish to buildings from this era. This type of external finish is known to suffer from “shelling” of the individual tiles resulting from delamination from the mortar backing, this particularly occurs at joints and corners where thermal and building movements occur.

Typical example of potential tile shelling at movement joint in facade.

Movement joint in facade. The joint above shows signs of a previous repair.

Example of cracking and movement to rear roof parapet edge together with possible risk of mosaic tiles being shed

5.0 REVIEW & CONCLUSIONS

5.1 Concrete Structure:

The purpose of this assessment was to understand the condition of the gallery structures and spandrel wall panels. 30No samples had been taken on the second floor in the main pool hall which has shown low levels of Chloride. The humidity within the pool area has deteriorated the existing structure and is now in need of repairs.
Previous internal breakouts that have been left open to the environment on the 2nd floor and show very serious loss of section to the steel. This is to be expected in the corrosive environment.

We know from industry experience that concrete does deteriorate and particularly in specific types of environments.

Conclusion:

We believe that the existing concrete structure has continued to deteriorate further since previous testing was carried out. The limited nature of the previous testing essentially to the basement areas, did not give an overall picture of the structure as a whole at that time.

We are of the view that action and remedial works should be carried out to maintain the building in a usable condition going forward. Concrete coating and repair systems are now available (anodize protection) that can resist/arrest deterioration of the concrete structure from the effects of carbonation and chloride attack, and a strategy needs to be established to carry out such works in a timely manner.

To determine a strategy, the scope of works, remedial repair and coating systems, timescales and costs, in broad terms we consider that you will need to:

Investigate and determine the product systems to be used to both repair and protect the concrete structure. The repairs should be done with the view of maintaining a safe structure which would be protected from the elements. The main areas of concern are within the basement and the second-floor balconies. Access to the first-floor ceilings was not available at the time of the assessment and further investigation would be recommended to view the condition of the structure at this level.

5.2 External Mosaic Tiling:

LBTH BATS report dated May 2003 identified issues with the external Mosaic tiled finish. The types and extent of defects noted are still present and the condition has continued to deteriorate further, with the potential “shedding” of tiles. This is particularly likely around joints, to soffit areas, to areas affected by thermal movements, and where areas are affected by water penetrating the backing.
The soffit of a southern ground floor spandrel above the window has been spalling onto the pedestrian walkway below.

All these defects exist, this is an industry known condition which should be taken as a serious health and safety issue that requires addressing to prevent potential injury.

Conclusion:

As stated in our previous report in 2017 - we must advise either removal of the tiles or encapsulation by over cladding.

5.3 Spandrel Walls:

Walls: Following the structural survey the walls are an insitu concrete cantilever wall structure tied to the floor slabs.
The inside face was cast against wood wool slabs as insulation with eml and plaster finish, the exterior face being rendered with the mosaic tiles applied.

The use of wood wool slabs in formwork is known to cause the loss of fines from the concrete resulting in an open texture with exposed reinforcement. There was evidence that some reinforcement was exposed at the time of the survey.

Conclusion:

The walls are in a poor condition with reinforcement showing signs of deterioration.

To determine a strategy, the scope of works, remedial repair and coating systems, timescales and costs, in broad terms we consider that you will need to:

> Investigate and determine the product systems to be used to both repair and protect the concrete structure. The repairs should be done with the view of maintaining a safe structure which would be protected from the elements.

5.4 Windows:

The existing windows were identified as being in poor condition allowing water to penetrate the building in 2003, and this situation has been allowed to continue. Water had penetrated the building around the windows in the past due to poor installation and detailing, this potentially adding to the deterioration internally of the spandrel panels which resulted in removal of the linings at 2nd floor gallery level.

This water penetration may also be aiding the spandrel wall structure contained behind the wood wool lining to deteriorate further. The Investigation of the window fixings on the 2nd floor appear to show no apparent issues with mechanical fixing into concrete cills and soffits. The external cill weatherproofing is weathered and is leaking in a number of places – though the fixings have corroded at the cill level internally – it is not extensive, just localised (the galvanising on the steel fixing plates is mostly intact). We noted that there was a window which was cracked, this is indicated on our drawing **18003-EL2-R**

Conclusion:

There is no change from our previous report in 2017. We would agree with the conclusions drawn in the 2003 report prepared by LBTH BATS that replacement of the windows is required to address both the condition of the window units, and the poor window detailing and installation.

5.5 Internal Gallery Ceilings:

The 2nd floor gallery level is in poor condition, there is deterioration of the concrete structure, signs of cracks in the concrete and corroded reinforcement affected by the damp conditions.
The “Hyrib” roof slab reinforcement has severe corrosion.
The secondary ceiling support structure is in a poor state and should be removed.

Whilst contained over the gallery we do consider there to be a possible risk of failure which could result in debris ending up at pool level.

Conclusion:

We would advise removal of all secondary ceiling support elements.
The existing “Hyrib” roof slab reinforcement and concrete structure requires repairs and some consideration to protect the structure.

5.6 External Drains:

The drains on the west flat roof were blocked by leaves.


Conclusion:
We must advise the drains are to be unblocked and a strategy put in place to prevent future debris.

5.6 Internal Changing Rooms:

There is evidence of past leakage on the ceilings of the internal changing rooms. When assessed, this issue does not appear to be an ongoing issue and most likely a result of service leakage.

Conclusion:
We would recommend monitoring this area to ensure there is no further leakage.

6.0 SUMMARY

We would summarise our conclusions as follows, taking into account previous reports and test results:

• Previous reports established that the concrete structure had defects requiring action which have generally not been acted upon.

• We consider that the structure has continued to deteriorate from previous reports.

• We agree with the previous report findings, and that with an appropriate repairs and remedial works strategy put in place, the building can remain in use. However, we would advise that this should be acted upon as soon as reasonably practical.

• The encapsulation or removal of the external mosaic tiling should be carried out to avoid any potential health and safety concerns. This is a known hazard and was advised in the LBTH BATS report dated May 2003.

• Suspended ceilings to the 2nd floor gallery area had been removed. The remaining levels were visually inspected at the time of the survey and are safe for purpose.

• All drains to be cleared from debris to prevent pooling on the flat roofs.

Immediate Action
• **External Mosaic Tiling**: We must advise either removal of the tiles or encapsulation by over cladding. Priority of phasing would be EL1, EL2, EL3 & EL4. • **Windows**: All windows to be made water tight as a temporary measure prior to replacing.
Medium Term Action (3-6 Months)
• Windows: Windows to be replaced,
Long Term Action (12 Months)
• Concrete Structure: Remedial works to be carried.

7.0 LIMITATIONS

This structural assessment has been prepared on the basis of an intrusive investigation to assess the existing building by way of obtaining concrete samples and a visual inspection where possible. This is not intended to be exhaustive, but to give general overview of the specific stated scope. A full structural investigative survey of the building or associated elements was not carried out and, therefore, Chamberlain Consulting LLP can accept no liability in respect of defects or issues outside the scope of our appointment.

Inspection and Assessment Report prepared by

Nick Snow

For Chamberlain Consulting LLP

Checked By:

Mark Robinson Meng CEng MIStructE MIMechE

STRUCTURAL ASSESSMENT

of

ST GEORGES LEISURE CENTRE
THE HIGHWAY
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LONDON BOROUGH OF TOWER HAMLETS

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INDEX

1.0 INSTRUCTIONS & SCOPE

2.0 EXISTING STRUCTURE

3.0 SITE OBSERVATIONS

4.0 REVIEW OF PREVIOUS REPORTS

5.0 REVIEW & CONCLUSIONS

6.0 SUMMARY

7.0 LIMITATIONS

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1.0 INSTRUCTIONS & SCOPE

We were instructed by Tim Clee of the London borough of Tower Hamlets to attend site and provide an initial structural assessment on the structural elements of the building with particular regard to the insitu concrete frame and the external elevations.

Barry Jefferies of Chamberlain Consulting LLP visited site on the 22nd March 2017 to carry out a review of the building. This assessment is based purely on visual site observations together with a review of previous condition surveys carried out in 2003, 2007, & 2016. No intrusive investigations were carried out and the external elevations were viewed from ground level and other accessible vantage points.

2.0 EXISTING STRUCTURE

The existing building is an insitu reinforced concrete framed structure built in the late 1960's - early 1970's, and has two swimming pools, the main pool being suspended over the reinforced concrete basement plantroom. The ground floor appears to be solid insitu concrete, and it is assumed that the upper gallery floors around the pool enclosure at 1st and 2nd floor levels are of similar construction. The roof structures are unknown but in one location steel “Hyrib” type soffit was evident, this being used as a permanent formwork/reinforcement to the perimeter, the main pool roof most likely being a concrete shell.

External elevations have continuous band windows to the main pool hall with reinforced concrete upstand spandral walls externally faced with mosaic tiles and internally lined with woodwool slabs. The single storey section of the building containing the small pool is brickwork with isolated windows as is the ground floor storey to the main pool block fronting The Highway.

3.0 SITE OBSERVATIONS

3.1 Internally

3.1.1 Basement Plantroom below Main Pool This area is effectively a reinforced concrete box structure with a series of isolated columns supporting the suspended ground floor and main pool structure over. In reviewing the existing it is clear that there is minor seepage of pool water through the original construction joints.

The warm and relatively damp environment in the space and the use of aggressive pool chemical treatments, has resulted in spalling of the concrete and rusting of reinforcement, due to the poor control of concrete cover leading to insufficient protection to the embedded steel reinforcement. This is particularly evident to a number of columns where previous poor quality repairs have be carried out, this also being identified in several of the previous reports.

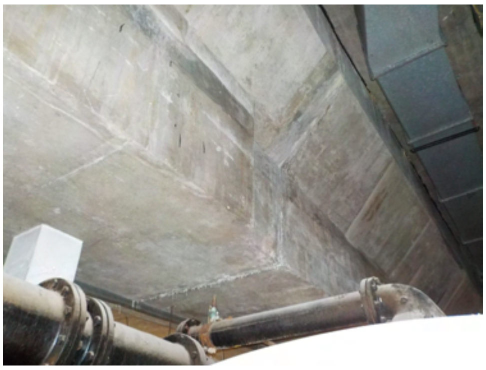

Examples of water seepage through original construction joints


Examples of previous poor quality concrete repairs to columns. In the photo on the left it is clear there is a live water leak coming from ground floor pool hall level, the water following cracking in the previous concrete repair. This column is referenced TA1 in the Martech condition report carried out in 2007.

Close up view of the top of the column noted above clearly showing the current continual water leakage from the pool side areas above together with the build up of salts.

Typical views of various elements within the Plantroom
The photos above give a general overall condition within the space. Water leakage is generally from the weak areas of original construction joints. Much of the remaining areas visually appear to be in fair condition for their age, with no significant changes since the previous report dating from 2007.

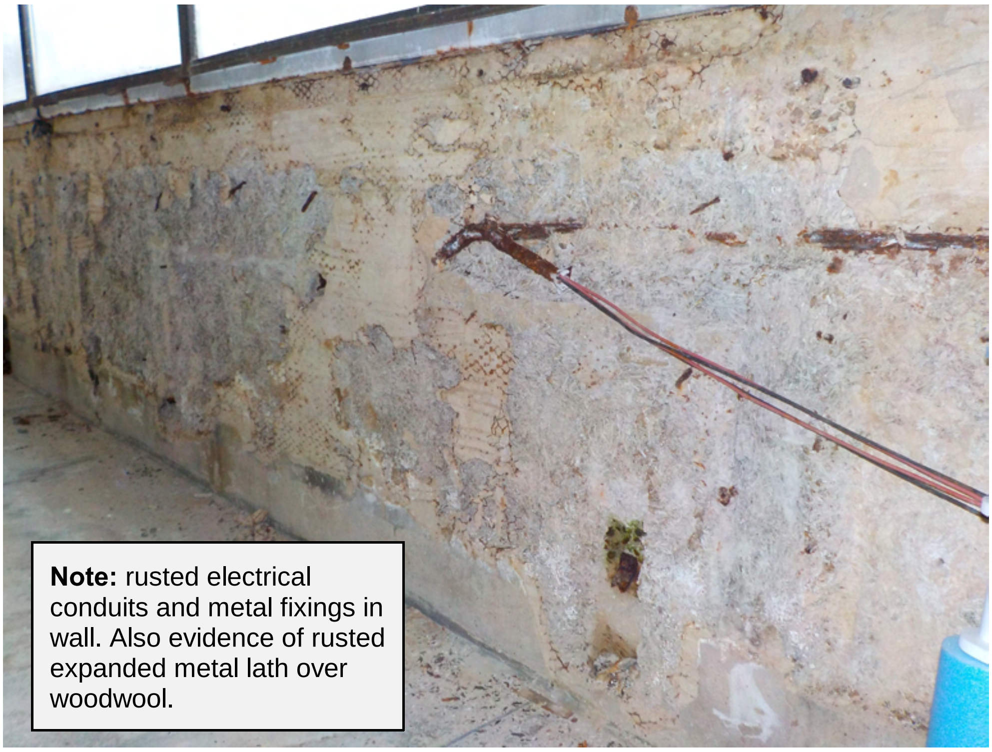
3.1.2 **Main Pool Hall** This is a large single space with viewing galleries at 1st and 2nd floor levels, the later having been closed off for a number of years due to Health and Safety concerns (Note, closed prior to 2003 report).

View of Main Pool Hall

Pool level and 1st floor level gallery are generally in fair condition with regular upkeep of the walls and floors carried out. The internal faces of the walls have been relined to the 1st floor gallery with a board material and decorated. There is little to comment on structurally to these levels as all structural elements are effectively covered.

At 2nd floor gallery level it is possible to see some structural elements particularly to the perimeter walls. At this level all the original plaster wall finishes have been removed exposing woodwool lining to the concrete spandrel walls. This lining was we presume to act as insulation and was placed into the shutter prior to casting the concrete. In places this has been cut away exposing rusting embedded steel fixings, electrical conduits, etc. In addition the interface at window cill level is exposed and on the day of our visit it was raining, and water was penetrating the building and running down the wall face in several locations.

To the ceiling over the 2nd floor gallery, large areas are affected either by the humid interior environment of the pool hall, and or by water penetrating through the roof. Sections of the plasterboard are clearly sagging and several sections are in the process of collapsing.



Typical view of Main Pool Hall spandral wall 2nd floor level

Close up view of wall window interface

View of water penetration at spandrel wall / window interface

It is likely that the window fixings have been affected by the water penetration with rust patches visible along the cill trim.

View above partially collapsing ceiling over 2nd floor gallery

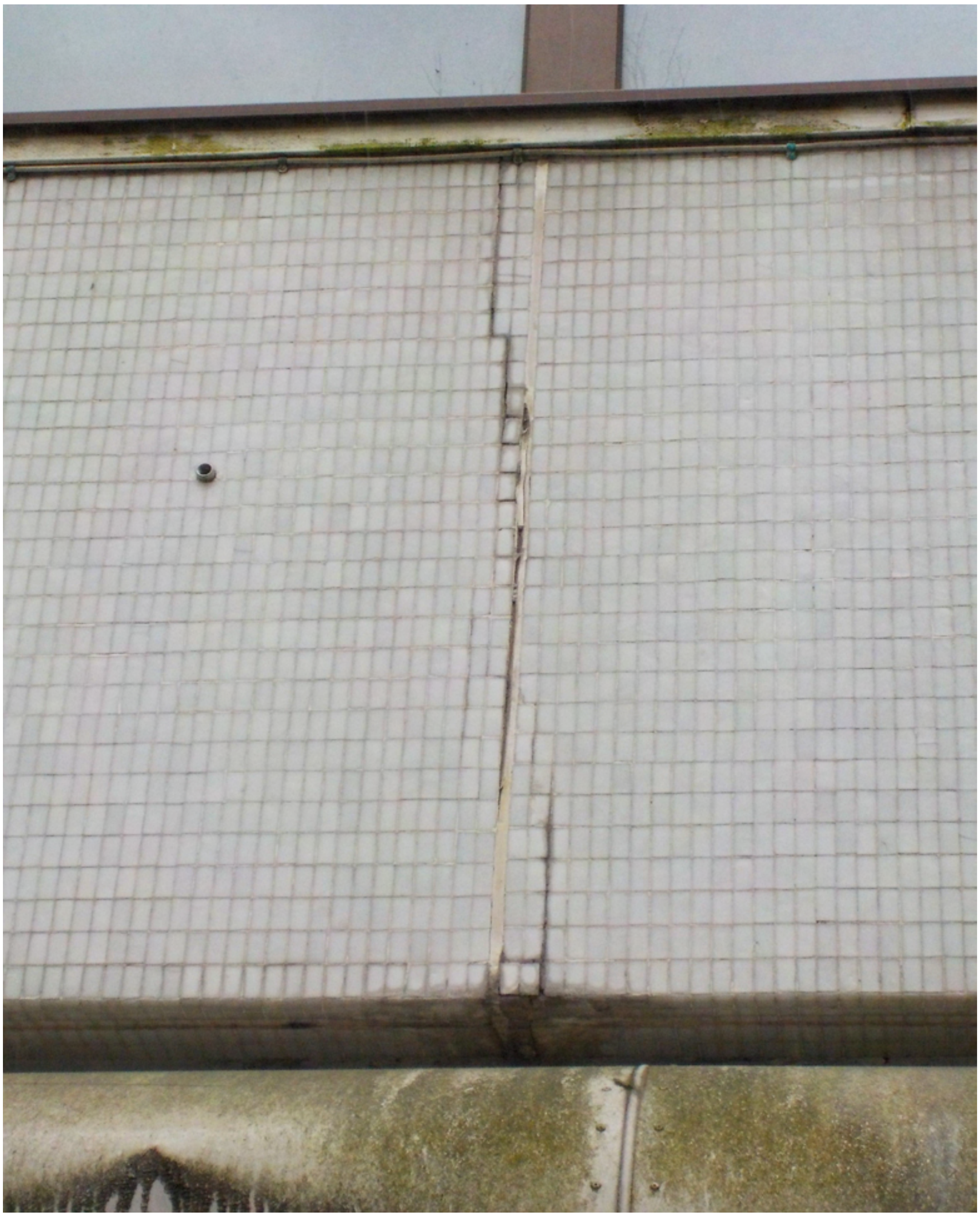
It can be seen that the ceiling fixings on the left side have failed. Also note “Hyrib” roof slab reinforcement (arrowed).

View along 2nd floor gallery

Water damage to the ceiling is clearly evident as is the sagging of the boarding along the window line. Although not clear from this picture there is also some evidence of windows having moved slightly, this questioning the adequacy/ condition of the fixings.

3.2 External elevations

We carried out a general walk round to the exterior of the building to visually assess condition, cracking and any movement. The external faces are covered with a small mosaic tile which was commonly used as a finish to buildings from this era. This type of external finish is known to suffer from “shelling” of the individual tiles resulting from delamination from the mortar backing, this particularly at joints and corners where thermal and building movements occur.



Typical example of potential tile shelling at movement joint in facade.

Example of cracking and movement to rear roof parapet edge together with possible risk of mosaic tiles being shed

4.0 REVIEW OF PREVIOUS CONDITION REPORTS

We have been provided with four previous reports on the building as follows:

LBTH Building & Technical Services Report 10 year plan dated May 2003.

WCJ Structural Report Ref: 16143/BT dated June 2003.

Martech Ltd Targeted concrete condition report ref:07127 dated 22/11/2007.

Pellings condition survey summary report dated July 2016.

We have reviewed the contents of these reports and would make the following observations concerning their findings and conclusions with appropriate extracts of the reports included where relevant.

4.1 LBTH Building & Technical Services Report 2003.

This report provided a snapshot on the condition of the building at the time with all aspects from structure to services covered in general terms, and identified areas of concern.

4.1.1 Concrete Structure

4.0 INTERNAL SURVEY - GENERALLY

4.1 Structure - Concrete frame
Columns to the main pool structure were inspected from within the building and many were found to be in poor condition as a result of water leakage.

4.2 The columns have been designed to house and conceal rainwater downpipes that take water from the main roof area, vertically through the spectator galleries and poolside, exiting the columns within the basement area by way of bends, branches and pipes to the main drains.

4.3 The condition, size and type of pipe within the columns, and the condition of the concrete that encapsulates them could not be inspected. This information can only be determined from destructive investigation.

4.4 Several of the columns, as inspected at both gallery levels, exhibit severe water staining particularly at the upper level where metal electrical boxes fitted directly to them have corroded badly.

4.5 These columns are clad internally with mosaic tiling - as externally

4.6 poolside appear to be in a generally fair and reasonable condition

4.7 Concrete columns within the basement area were inspected and two were found to have significant vertical fractures. These should be investigated at the earliest opportunity by a structural engineer to establish cause and condition prior to evaluating repair options.

The above extract from the report clearly identified issues with the buildings concrete structural frame condition internally in broad terms. However it gave no specific recommendations, but advised in paragraph 4.7, that investigations and a structural engineers report should be obtained.

We believe as a result of the reports recommendation in 4.7 that WCJ were appointed to provide a structural report. This report was carried out the following month in June 2003.

4.1.2 External Mosaics

B.A.T.S. SURVEY REPORT ST GEORGE'S POOL'S

2.0 **EXTERNAL ELEVATIONS**

2.1 **External Walls & Soffits - Mosaic tiled**
Concrete, external floor slabs, columns and infill masonry are rendered and faced with a white mosaic tile finish

2.2 Generally the tiled cladding is in poor condition with missing, cracked and loose areas to vertical and soffit surfaces. Areas of tiles are also heavily water stained. These are very common defects which have contributed to the loss of popularity of this type of finish.

2.3 Analysis of the bedding material - thickness, cement content and presence of any bonding agents is required to confirm the reason for failure but it is believed that the main problems are water penetration and differential thermal movement between the concrete frame/floors and the infill panel materials.

2.4 The situation is worsened as insufficient joints are provided to accommodate expansion and contraction. The exception is the parapet walling where expansion joints were found to be in fair condition.
British Standards require that movement joints be incorporated horizontally at each storey and vertically at approx 3 m centres and, also wherever there is a change in background material. Vertical joints at this building are at 4.5 m. centres

2.5 The tile clad soffit projecting over the public highway (The Highway), is in particularly poor condition with significant water staining and mature stalagtites indicating a long-standing problem.

2.6 Staining and cracking of tiling and concrete soffit evident to the 1st floor slab above and adjacent to the north elevation - new plant room access door.

2.7 No attempts at repairing the damaged tiling were noted to have been made
Patchwork repair of failed areas will look unsightly and not overcome the longer-term problem of differential movement.

2.8 The only practical solution is total overcladding with a specialist system designed to accommodate and insulate against such thermal movement, however this may present problems in obtaining necessary planning permission.

2.9 Should approval be sought/agreed, then this work should be planned in conjunction with a total external refurbishment including complete replacement of windows and infill panels to the upper floors - designed to be brought forward, eliminating the need for window reveals, soffits and cills.
(see also Windows & infill masonry)

2.10 Structural external columns – visible at the main entrance, are also clad in mosaic tiling and this was found to be in generally fair condition

The above extract from the report identified issues with the external building cladding particularly the Mosaic tiled finish. From our review it would appear that none of the recommendations of this report have been carried out. The types and extent of defects noted are still present and the condition has continued to deteriorate further. Failure and shedding of external applied mosaic tiling of the type used on the building is an industry known condition which should be taken as a potential health and safety risk.

4.1.3 External Windows

B.A.T.S. SURVEY REPORT ST GEORGE'S POOL'S

2.13 Windows - Generally
Windows are metal throughout, single glazed with secondary glazing to the ground floor small learner pool and bronzed frames with double glazed units to the upper floors.

2.14 Windows to upper level spectator galleries are in poor condition thoroughout with double glazed units seals having all broken down.

2.15 Water evidently penetrates the structure around the windows at head and cill.

2.16 Externally, the detailing around the windows is poor, particularly at cills where asphalt is simply dressed up against the vertical face of the frame.

2.17 Differential thermal movement between the asphalt and the frame and shrinkage and cracking of the asphalt within metal trim pieces, has predictably created open joints allowing water penetration and this has happened throughout.

2.18 It is recommended that windows are replaced throughout to incorporate a standard projecting cill detail

2.19 Doors - Generally
Metal security gates are provided to the entrance to the laundry and are in fair condition

2.20 A single timber door, providing emergency exit from the boiler room, has a metal security grille fitted to casement glazing and a metal sheet fitted to the outer face - all in fair and serviceable condition.

2.21 A pair of timber doors provide escape from main pool area - emergency staircase. In fair and serviceable condition

The above extract from the report identified issues with the existing windows. From our inspection the defects noted are still evident today, with water penetrating the building due to widow defects, poor building detailing, and age related deterioration of the installation.

Summary comments:
In reviewing the document as a whole and from the extracts of the report included above, it is clear that in 2003 the building was suffering from around 35-40 years of age related defects and lack of maintenance. Defects in the original construction, poor detailing, lack of regular maintenance, and life expired materials commonly found in buildings of this age, were all present at the time of the report.

As far as we can establish, little of the advice contained in the report has been put into practice. The result is that the building fabric and structure have continued to deteriorate for a further 14 years. We consider that the original advice given in the 2003 report from a building fabric and structure point of view is still relevant and requiring action.

4.2 WCJ Structural Report 2003.

We believe that this report was commissioned as a result of the comments made concerning the structure in the LBTH BATS report noted in 4.1 above. The report was limited to a visual assessment of the structure only, with a limited amount of concrete sampling and testing to determine concrete condition. Some 25 concrete samples were taken from various internal structural elements, these samples being tested to determine carbonation and chloride levels. The exact location of samples cannot be confirmed other than as noted in the test results.

2.4 The Findings of the Concrete survey and Testing

General

St. Georges Pools is an indoor swimming pool.

The environment within swimming pools are known to represent severe conditions to structures such as reinforced concrete.

In particular, sodium hypochlorite used as disinfectant in the pool being a source of chloride attack.

The high humidity in combination with the use of high alumina cement has historically lead to collapse in structures.

The findings will therefore be reported under headings Chlorides, High Alumina Cement etc.

Chlorides

Chloride levels within the area surrounding the pool and galleries were found to be not significant. Levels ranged between 0.1 and 0.2% which are well below the threshold of 0.4%.

Chloride levels within the plant room and soffits to underside of the pool side were found to be high with values ranging above the 0.4% threshold up to 1.9% at test site 19.

Cement

Cement from all test sites was found to be Ordinary Portland Cement (OPC). The percentages of cement content are consistent through all test sites.

Cement contents vary slightly between 324-360kg/m^3 with an average value of 342kg/m^2, this level of cement content is what would be expected for a 1960s/70s swimming pool structure.

There was no evidence of High Alumina Cement.

Alkali Silica Reaction

The petrographic and microscopic analysis did not reveal any evidence of the presence of alkali reactive aggregate in the samples taken for analysis. It is therefore our opinion that it is unlikely that alkali reactive aggregate has been included in any of the structural concrete used in this building.

Carbonation

Carbonation within the pool area was low at arourd 5mm.

In only 3 out of 25 test sites the depth of carbonisation was coincident with the depth of reinforcement, indicating a loss of the passivating protective environment to the reinforcement.

Sulphates

The sulphates found are approximately in the amount expected to be found from within the constituent cement.

Corrosion

Corrosion appears to be confined to the plant roorr and in the corridors to the underside of the pool side, at test locations.

Cover was found in at least 6 locations with low cover for the severity of environment.

Spalling to columns is evident at test sites 15, 20 and 25. The main reinforcement is exposed in short lengths and at 15 there appears at present to be no significant loss of cross sectional area. Test site 25 is located over corridor rooms with limited access but it was observed that there is significant loss of cross sectional area to reinforcement which needs closer inspection.

The extracts from the report are clear in their findings in terms of the concrete type and condition, and can be summarized as follows:

- HAC was not present in the concrete.
- The concrete contained the expected levels of cement.
- Carbonation was only consider to be an issue in 3 of the 25 test sites.
- Chloride levels within the concrete were found to be high in the pool and plantroom areas.

RESULTS **TABLE 1(See enclosed diagram A for sampling locations)**

DEPTH OF CARBONATION, DEPTH OF COVER, VISUALS

Lab No.	Location	Carbonation mm	Cover mm	Visuals
2698/1	Lower gallery	<5	55-60	Tile/wdwl
2698/2	Ditto	<5	60-65	Tile/wdwl
2698/3	Ditto	<5	55-60	Tile/rend
2698/4	Ditto	<5	60-65	Tile/rend
2698/5	Upper gallery	<5	mesh	Rend/wdwl
2698/6	Ditto	<5	50-55	Rend/wdwl
2698/7	Ditto	<5	60-65	Rend/wdwl
2698/8	Ditto	<5	70-75	Rend /wdwl
2698/9	Ditto column	<5	55-60	Tile/conc/exp bar
2698/10	Inter gallery	<5	mesh	Ren/wdwl
2698/11	Ditto	<5	ditto	Ren/wdwl
2698/12	Ditto	<5	ditto	Ren/wdwl
2698/13	Ditto	<5	ditto	Ren/wdwl
2698/14	Plant rm soffit	5-10	25-30	mild eff st
2698/15	Ditto column	<5	25-30	H&VCB/Sp/Cr
2698/16	Ditto beam soffit	5-10	35-40	Heavy eff St
2698/17	Ditto column	<5	30-35	VCr/heavy eff St
2698/18	Corridor wall	10-15	10-15	Heavy moist St
2698/19	Ditto soffit	10-15	10-15	CB/Sp x16 ln/mbs
2609/20	Ditto column	<5	30-35	Heavy eff St
2698/21	Ditto soffit	5-10	15-20	CB/Spx2,COR St
2698/22	Dose room slab	<5	35-40	Mild eff St
2698/23	Corridor wall	5-10	20-25	LaCB/Sp, eff St
2698/24	Store room slab	5-10	10-15	CB/Spx12,Lcr
2698/25	Corridor column	5-10	15-20	LaCB/Sp, lnk/mbs

Legend : Inter-intermediate, rm-room, ren-render, wdwl-wood wool, eff-efflorescence, H-horizontal, V-vertical, CB-corroded bar, Sp-spall, COR St-corrosion staining, L-longitudinal, Cr-crack, Conc-concrete, La-large, lnk/mbs - links/main bars, exp - exposed

RESULTS **TABLE 2(See enclosed diagram A for sampling locations)**

CHLORIDE/SULPHATE/CEMENT CONTENTS/TYPE OF CEMENT

	Chloride content*	Sulphate content+	Cement content	Cement type
2698/1	0.1%	0.44%	15.2%	Portland
2698/2	0.2%	0.42%	-	ditto
2698/3	0.1%	0.40%	-	ditto
2698/4	0.1%	0.43%	-	ditto
2698/5	0.1%	0.43%	-	ditto
2698/6	0.2%	0.41%	-	ditto
2698/7	0.1%	0.43%	-	ditto
2698/8	0.2%	0.46%	-	ditto
2698/9	0.1%	0.44%	-	ditto
2698/10	0.1%	0.43%	-	ditto
2698/11	0.2%	0.43%	-	ditto
2698/12	0.1%	0.44%	-	ditto
2698/13	0.2%	0.43%	-	ditto
2698/14	0.3%	0.42%	14.9%	ditto
2698/15	0.3%	0.41%	-	ditto
2698/16	0.3%	0.40%	-	ditto
2698/17	1.1%	0.45%	15.6%	ditto
2698/18	0.5%	0.44%	-	ditto
2698/19	1.9%	0.45%	-	ditto
2698/20	0.9%	0.44%	-	ditto
2698/21	1.4%	0.43%	-	ditto
2698/22	0.3%	0.45%	-	ditto
2698/23	1.1%	0.42%	14.1%	ditto
2698/24	1.3%	0.40%	-	ditto
2698/25	0.8%	0.44%	-	ditto

Legend : *Chloride ion(Cl) by weight of cement, + sulphur trioxide(SO3) by weight of concrete, cement content by weight of concrete and carried out on mixed similar component drillings. Mean cement value utilised in chloride calculation.

It is considered, however, that repair of concrete should be considered together with the replacement/repair of waterproof membranes/tiling to the pool side to mitigate replenishment of chloride contamination.

Repairs are likely to include:

- Steelwork column strengthening.
- Cathodic protection to areas with high chloride contamination where evidence of corrosion is non existent.
- Repairs to spalled soffits/columns to include removal of concrete around reinforcement and reinstatement with sprayed concrete (Gunite).

Summary comments and conclusions:
This report only consider the structural concrete at basement level and the immediate pool structure above. The extract from the report above, concludes a possible repair strategy to damaged concrete areas, and further sections in the report expand on these points. However from the evidence we have seen on site none of the recommendations of this report have been acted upon with the exception of two column repairs in the basement (see later comments). We consider that the advice contained in this report is still relevant.

4.3 Martech Ltd Targeted concrete condition report 2007.

We are unclear as to the reason for commissioning this report other than the recommendations made in the WCJ report from 2003 some 4 years previous, that further testing would be advisable. In looking at the areas tested in this targeted report they seem to be in the same areas as the WCJ testing being concentrated in the basement plantroom and lower gallery (upper basement) areas around the smaller training pool.

BREAK OUT

Details of the exploratory break out findings are to be found on the relevant detailed test area survey sheets, in the Images Section to this report.

The breakouts are summarised in the following table:

Test Area	Element	Reinforcement Details	Depths of Cover (mm)	Depths of Carbonation (mm)	Comments
TA1	Column (at spall)	1 x ~10mm bar	30	<5-50	Heavily corroded
TA2	Column	1 x 10mm bar	38	10-15	Clean and passive
TA3	Beam	1 x 14mm bar	10	5-10	Clean/LOP
TA5	Soffit	1 x 12mm bar	13	10-15	LOP
TA6	Beam	1 x 10mm bar	28	10-15	Clean and passive
TA7	Column	1 x 8mm bar	54	5-10	Clean and passive
TA8	Column	1 x 10mm bar	42	<5	Clean and passive
TA9	Soffit	1 x 10mm bar	10	15-20	Surface corrosion
TA10	Column	1 x 12mm bar	30	<5	Clean and passive
TA12	Soffit	1 x 10mm bar	10	20	Surface corrosion
TA13	Column	1 x 6mm bar	30	<5	Clean and passive
TA14	Soffit (at spall)	1 x 10mm bar	13	15-20	Heavily corroded
TA15	Beam (at spall)	1 x 12mm bar	15	>30	Heavily corroded
TA17	Column	1 x 26mm bar	45	35-40	Clean and passive
TA18	Beam	1 x 8mm bar	29	<5	Clean and passive

LOP = Loss of passivity

The extract to the right from the report recorded the opening up works carried out, and the condition and details of the existing reinforcement contained in the various concrete elements. This seemed to be biased towards columns and specific areas that were exhibiting defects at the time of the investigation.

Classification of risk in accordance with BRE Digest 444:Part 2:2000 is a complex procedure that we follow in general terms. The categories of risk are defined as follows: *negligible, low, moderate, high, very high,* and *extremely high.* Categorisation varies with source of chloride, age of structure, extent of carbonation and environmental exposure condition.

The results obtained at St Georges Pool are expressed as chloride ion by mass of cement, using an assumed cement content of 14% in the concrete.

For ease of ingressed chloride classification we have assumed the following criteria:

<0.30%: negligible to low risk
0.30 to 0.70%: moderate risk
0.70 to 1.0%: high risk
>1.0%: extremely high risk.

This is based on our extensive experience and our interpretation of Figure 5 in BRE Digest 444, part 2, 2000, assuming a worsening situation with on-going continued chloride ingress. Using this criteria the results are summarised in the following colour-coded tables:

Page 33

Basement

Element	Chloride Content (%)		
	Minimum	Maximum	Mean
Column	0.15	1.73	0.82
Beam	0.17	1.01	0.59
Soffit	0.30	0.40	0.35

Lower Gallery

Element	Chloride Content (%)		
	Minimum	Maximum	Mean
Soffit	0.08	0.23	0.15
Column	0.17	2.75	0.97
Beam	0.19	0.34	0.24

The chloride results were found to vary widely with there being significantly high values to the columns in both basement and lower gallery and the beams in the basement.

The extracts from the report above recorded the levels of Chlorides found within the concrete where tested. The levels found clearly indicated high levels of risk to a number of elements particularly to the basement pool plantroom as would have been expected based on previous information and reports. The levels are higher than reported in the WCJ report of 2003 suggesting continued deterioration.

The depths of carbonation noted are such that in 5 of the 15 tests the reinforcement is now within the carbonation zone, an increase over the 2003 samples.

WORKS REQUIRED

The following concrete repair and corrosion control advice for the elements at St George's Pool assumes that all top surfaces of treated concrete elements will be made fully waterproof.

In any event all instances of low cover must be attended to and all latent and visible corrosion damage repaired, such that any untreated reinforcement is in a sound alkaline condition. For concrete repair purposes any reinforcement found to be within 5 mm of the average carbonation front depth, must always be considered to be immediately at risk of corrosion.

For the most severely deteriorated elements (columns and beams in the basement and the column in the store room) we would recommend either traditional repairs combined with the installation of galvanic anodes (coupled to the reinforcement) or the recasting of the elements.

For the other elements we would recommend a combination of traditional repair techniques combined with the installation of corrosion inhibitors.

With the use of a corrosion inhibitor to deal with the latent damage it is only necessary to identify all hollow and delaminated areas of concrete for repair. Repairs must however be to a high standard in line with traditional techniques. The corrosion inhibitor deals with the latent damage via migration through the pore structure of the concrete, and adsorption to steel surfaces. A monomolecular layer coats the steel preventing moisture and oxygen reaching it, and hence corrosion.

It is important that a proprietary concrete repair system with a good track record be used, in conjunction with a recognised specialist contractor. Attention should also be paid to the selection of protective coatings. These should be vapour permeable and preferably elastomeric with all of these properties confirmed by independent test certificates.

We would, upon request, be very pleased to arrange more detailed advice and proposals, based upon our recommendations above.

Summary comments and conclusions:
Again this report concentrated its sampling, testing, and recommendations on the structural concrete at basement level and the immediate pool structure above. The extract from the report above, advises on works to be carried out including various applied protective coatings, concrete repairs, etc.

From the evidence we have seen on site the only recommendations carried out appear to be to the two worst affected columns ref: TA1 & TA2 in the report, with none of the other recommendations acted upon. The repaired columns are identified in section 3.0 above as being poorly repaired, and in our view are not to an acceptable standard. The remaining advice contained in this report has not been acted upon, and is therefore still relevant.

4.4 Pellings condition survey summary report 2016.
This summary report made no reference to structural condition, nor advised any further investigation or reporting.

5.0 REVIEW & CONCLUSIONS

5.1 Concrete Structure:

All of the previous reports carried out have identified the need to carry out repairs to the concrete structure, and take measures to protect the structure from the effects of further deterioration. In general the advice given in the various reports since 2003 have not been implemented as far as we can see, with the exception of repairs to 2No. concrete columns in the basement, these repairs being of poor quality.

Previously little or no effort has been expended in investigating the condition of the upper concrete frame structure, floor or roof which we are surprised at particularly within the aggressive hot humid environment of the pool hall. Therefore there is no information as to the condition of these areas, and this needs to be considered going forward.

From the previous reports and testing carried out it is clear that the structure where investigated at basement levels had deteriorated between 2003 and 2007 with the levels of carbonation and chlorides increasing. The concrete tests previously carried out are only a “snapshot” in time in a particular location, and therefore the differences in results could indicate local variations in condition, or point to deterioration. We know from industry experience that concrete does deteriorate and particularly in specific types of environment and conditions such as experienced at St Georges Pool.

Conclusion:

We believe that the existing concrete has continued to deteriorate further since 2007 when the previously testing was carried out. The limited nature of the testing essentially to the basement areas, does not give an overall picture of the structure as a whole, and therefore little is known about the condition of the concrete structure above pool level.

On the assumption that this is no worse than previously tested we are of the view that action and remedial works can be carried out to maintain the building in a usable condition going forward. Concrete coating and repair systems are now available that can resist/arrest deterioration of the concrete structure from the effects of carbonation and chloride attack, and a strategy needs to be established to carry out such works in a timely manner.

To determine a strategy, the scope of works, remedial repair and coating systems, timescales and costs, in broad terms we consider that you will need to:

- Carry out further concrete sampling and testing, this to include the upper areas of the building to establish current condition. This needs to include areas in suspended ceilings around the upper floor galleries, and the roof structures over the pool.

- Prepare detailed surveys of all areas so that drawings can be prepared.

- Determine types and location of significant repairs to structural elements.

- Investigate and determine the product systems to be used to both repair and protect the concrete structure, including remedial works to leaking pool joints and replacement of waterproof membranes.

5.2 External Mosaic Tiling:

The LBTH BATS report dated May 2003 identified issues with the external Mosaic tiled finish. The types and extent of defects noted are still present and the condition has continued to deteriorate further, with the potential “shedding” of individual tiles possible. This is particularly likely around joints, to soffit areas, to areas affected by thermal movements, and where areas are affected by water penetrating the backing. All of these potential defects exist, together with the unknown type of backing and or adhesive coating used to attach the tiles. This is an industry known condition which should be taken as a potential health and safety issue that requires addressing.

Conclusion:

As clearly identified in the previous report, we must advise either removel of the tiles or encapsulation by over cladding.

5.3 Spandrel Walls & Windows:

Walls: The actual construction of the spandrel panels is unknown and the previous reports have conflicting statements. It is our opinion that the walls are an insitu concrete cantilever wall structure tied to the floor slabs. The inside face was cast against woodwool slabs as insulation with eml and plaster finish, the exterior face being rendered with the mosaic tiles applied.

The use of woodwool slabs in formwork is known to cause the loss of fines from the concrete resulting in an open texture with exposed reinforcement. If our assumptions on the construction are correct, there is a risk that the reinforcement could be exposed to corrosion potentially affecting structural performance.

Conclusion:

We would consider that intrusive investigation should be carried out to determine the exact construction detail, and this could be achieved by coring through the total wall thickness. In addition internally in a number of areas sections of the woodwool could be carefully removed back to the assumed concrete face with appropriate tests carried out to determine concrete condition, and if reinforcement is exposed. This would inform the process of preparing the repair and remedial works scope and strategy going forward.

Windows:
The existing windows were identified as being in poor condition allowing water to penetrate into the building in 2003, and this situation has been allowed to continue. We did not carry out a detailed inspection as this was not part of our brief, but it was clear from our visit that water penetrates the building around the windows due to poor installation and detailing, this potentially adding to the deterioration internally of the spandrel panels which resulted in removal of the linings at 2nd floor gallery level. This water penetration may also be allowing the assumed concrete spandrel wall structure contained behind the woodwool lining to deteriorate, and may also bring into question the condition and adequacy of the window fixings.

Conclusion:
We would agree with the conclusions drawn in the 2003 report prepared by LBTH BATS that replacement of the windows is required to address both the condition of the window units, and the poor window detailing and installation.

5.4 Internal Gallery Ceilings:

Whilst not a structural element we identified the suspended ceilings particularly at 2nd floor gallery level are in poor condition, distorted and failed in one location, with the materials used affected by the damp conditions. Whilst contained over the gallery we do consider there to be a possible risk of failure which could result in debris ending up at pool level.

Conclusion:
We would advise removal of these ceilings where affected. This would also have the benefit of allowing inspection of the concrete structures above. Consideration also needs to be given to close inspection of the remaining ceilings within the pool hall.

6.0 SUMMARY

We would summarise our conclusions as follows:

- Previous reports established that the concrete structure had defects requiring action which have generally not been acted upon.

- Based on our review of the previous investigative reports, and our visual review, we consider that the structure has continued to deteriorate.

- We agree with the previous report findings, and that with an appropriate repairs and remedial works strategy put in place, the building can remain in use. However we would advise that this should be acted upon in a timely manner.

- Further investigation works are required to areas not previously investigated, and to determine the current state of the concrete structure. This will allow the development of the scope and extent of works required together with determining the appropriate repair techniques and systems to use.

- The encapsulation or removal of the external mosaic tiling should be carried out to remove any potential health and safety concerns. This is a known hazard and was advised in the LBTH BATS report dated May 2003.

- We would advise removal of the suspended ceilings to the 2nd floor gallery area, and the remaining levels should be checked for safety purposes.

7.0 LIMITATIONS

This structural assessment has been prepared on the basis of a visual only review of the existing building, and is not intended to be exhaustive, but to give general overview of the specific stated scope. A full structural investigative survey of the building or associated elements was not carried out and, therefore, Chamberlain Consulting LLP can accept no liability in respect of defects or issues outside the scope of our appointment.

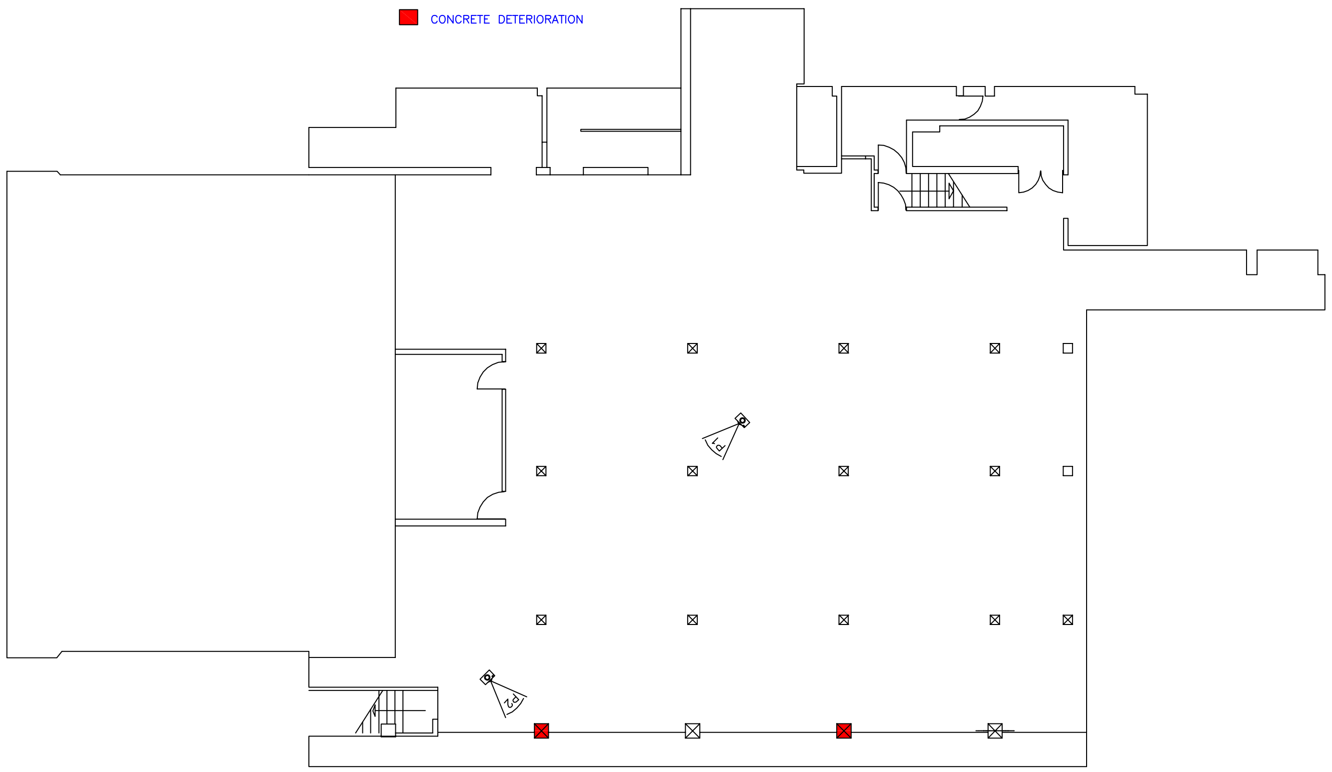
Assessment prepared by

Barry Jefferies

Barry Jefferies C.Eng MI Struct E
for Chamberlain Consulting LLP

PHOTO 1

PHOTO 2



BASEMENT PLAN

SCALE APPROX. 1:250@A3

NOTES:–

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SITE INVESTIGATION KEY

- ▽ SITE TESTING WORKS TO FACE OF EXISTING CONCRETE WALL OR COLUMN.
- ✕ SITE TESTING WORKS TO TOP OF EXISTING CONCRETE SLAB.
- SITE TESTING WORKS TO UNDERSIDE OF EXISTING CONCRETE SLAB OVER.
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Client. L B of TOWER HAMELTS

Architect.

Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION BASEMENT PLAN

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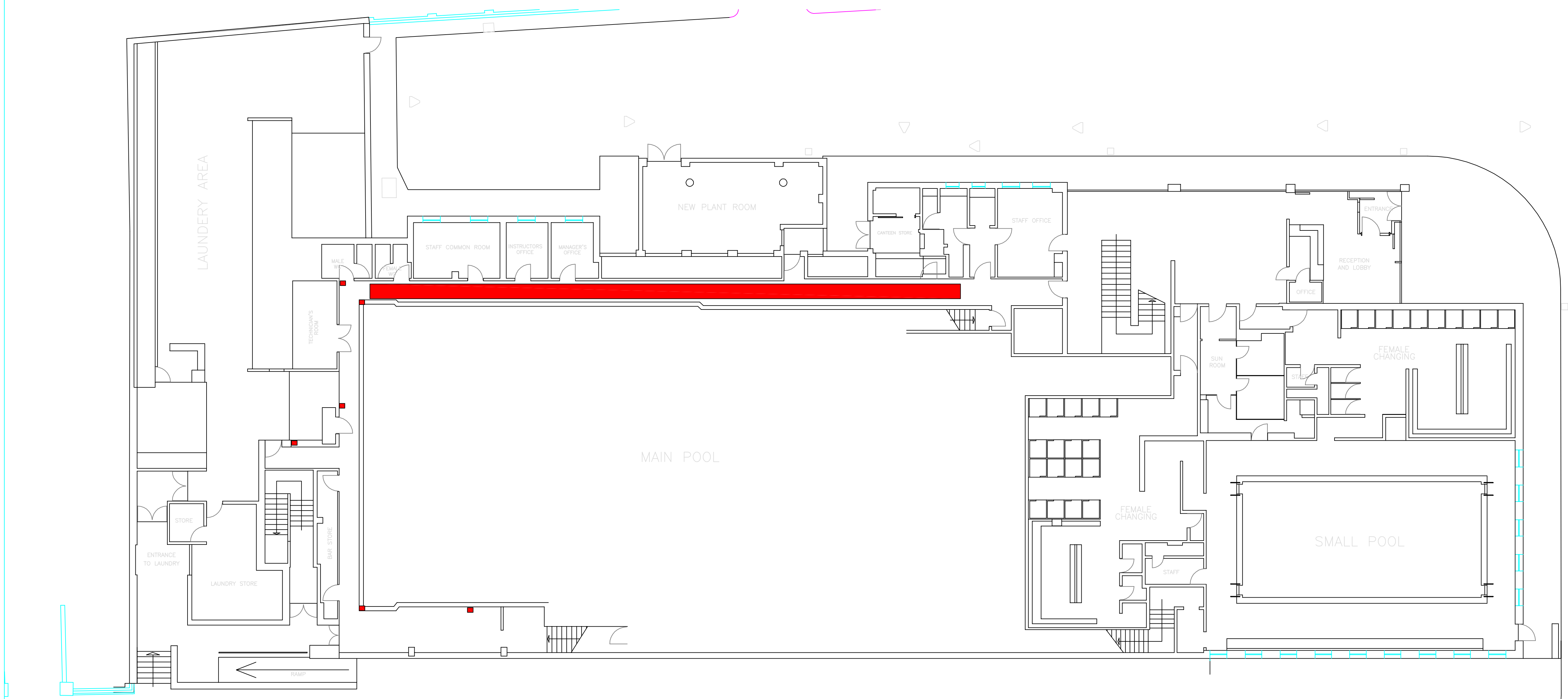

GROUND FLOOR PLAN

SCALE APPROX. 1:250@A3

SITE INVESTIGATION KEY

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Drawing Title. STRUTURAL INVESTIGATION GROUND FLOOR PLAN

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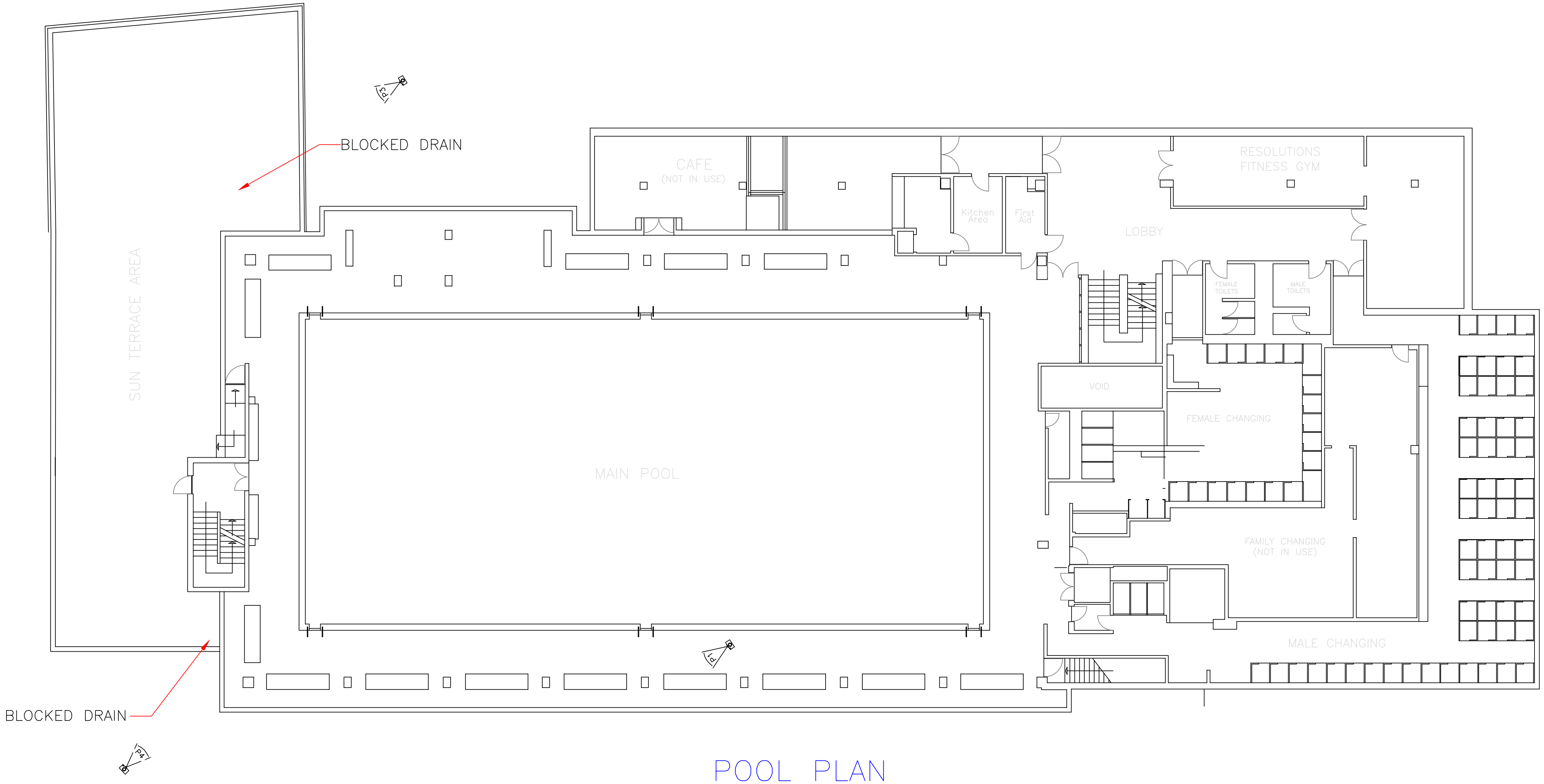
PHOTO 1

PHOTO 2

PHOTO 3

PHOTO 4



POOL PLAN

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- SITE TESTING WORKS TO UNDERSIDE OF EXISTING CONCRETE SLAB OVER.
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Client. L B of TOWER HAMELTS

Architect.

Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION POOL PLAN

Date. Aug'18		Drawn By. JB
Scale. AS NOTED	Dwg Size. A3	Checked By. NS

Drawing Status. RECORD

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PHOTO 1

PHOTO 2

PHOTO 3

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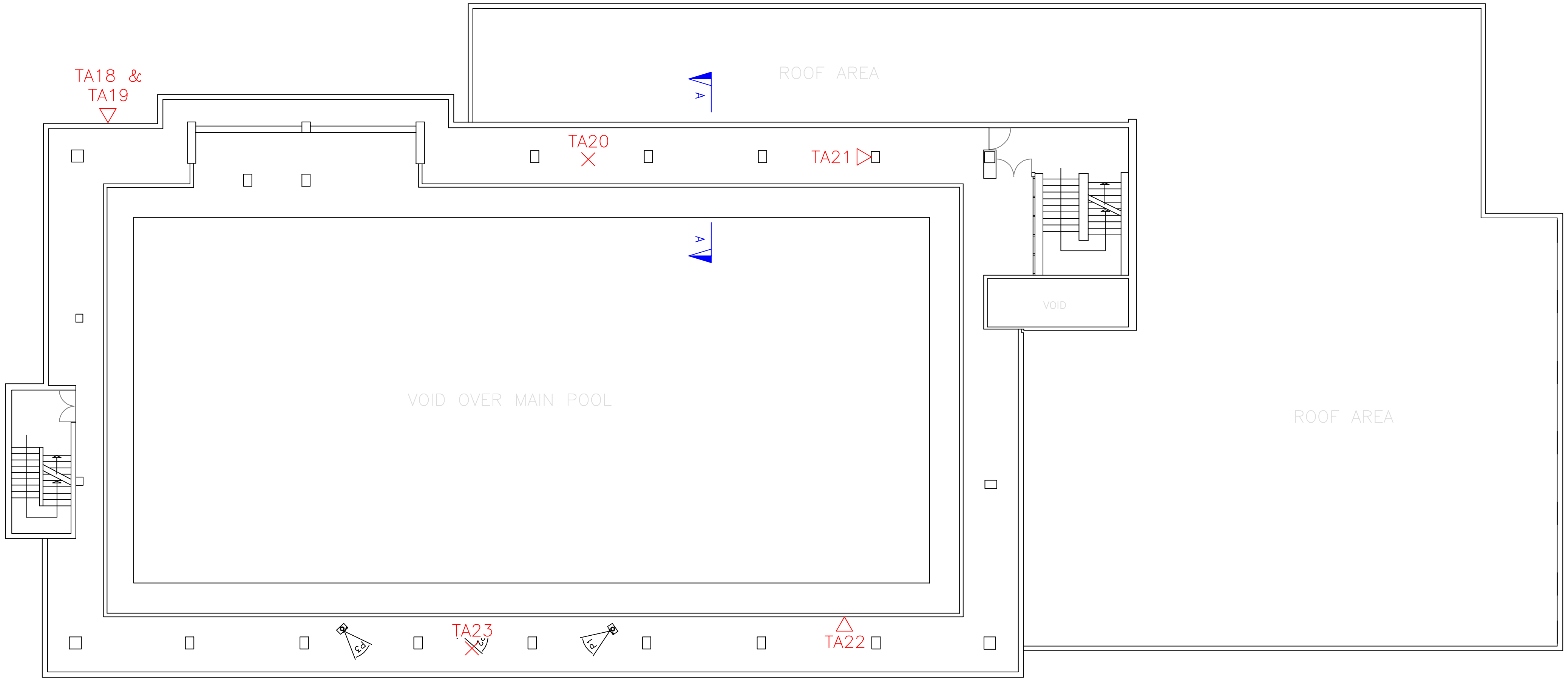

FIRST FLOOR PLAN

SCALE APPROX. 1:250@A3

SITE INVESTIGATION KEY

- ▽ SITE TESTING WORKS TO FACE OF EXISTING CONCRETE WALL OR COLUMN.
- ✕ SITE TESTING WORKS TO TOP OF EXISTING CONCRETE SLAB.
- SITE TESTING WORKS TO UNDERSIDE OF EXISTING CONCRETE SLAB OVER.
- PH20 DENOTES SITE PHOTOGRAPH. SEE DRAWINGS 18003–

INFORMATION SHOWN ON THIS DRAWING IS A RECORD OF SITE INVESTIGATION & SURVEY CARRIED OUT BY CCLLP IN AUGUST 2018

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Chamberlain consulting LLP
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Tel: 0208 468 1013
www.cc-llp.com info@ccullp.co.uk

Client. L B of TOWER HAMELTS

Architect.

Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION FIRST FLOOR PLAN

Date. Aug'18	Drawn By. JB
Scale. AS NOTED / Dwg Size. A3	Checked By. NS

Drawing Status. RECORD

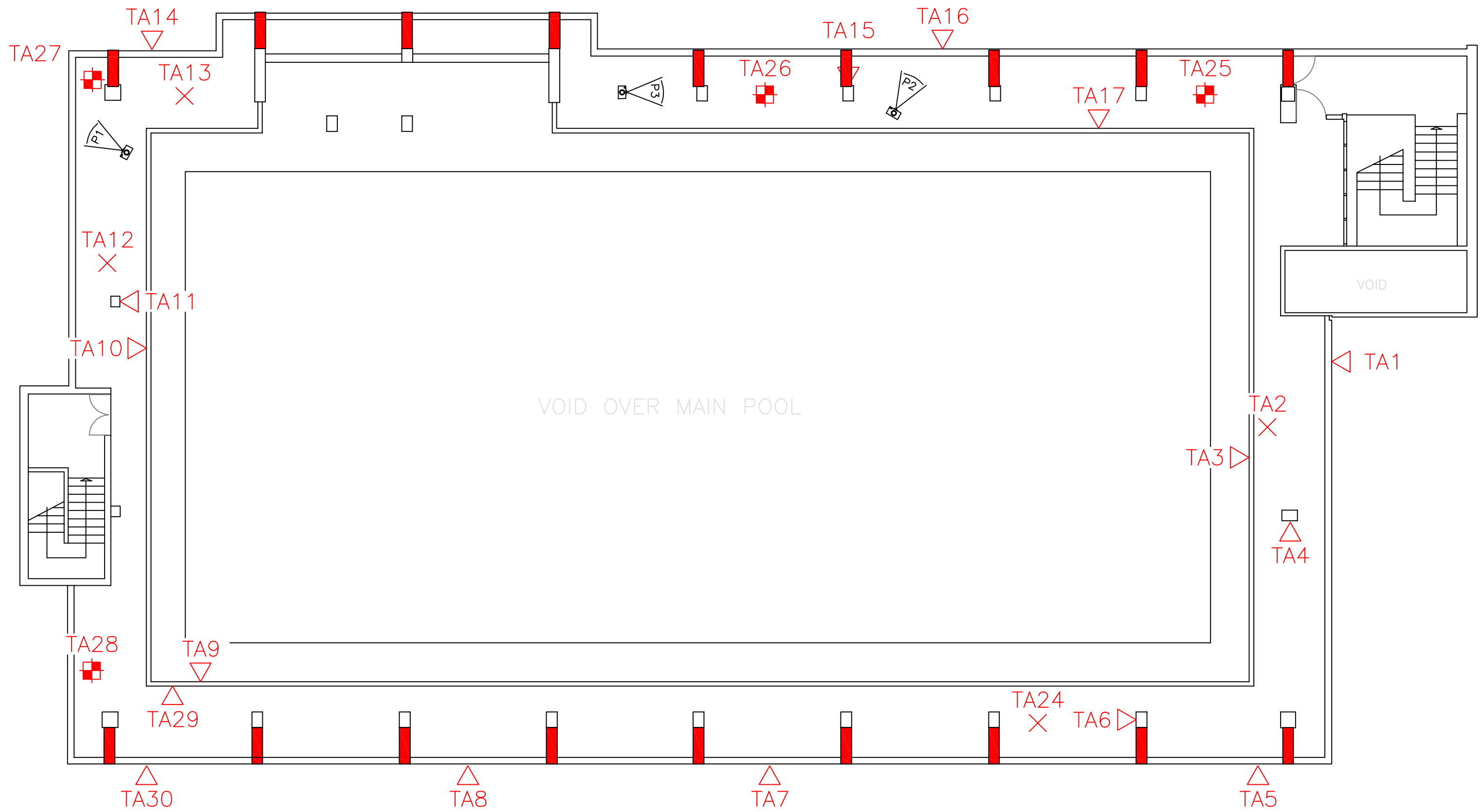
Drawing Number. 18003–201 Rev. R

PHOTO 1

PHOTO 2

PHOTO 3

CONCRETE DETERIORATION



SECOND FLOOR PLAN

SCALE APPROX. 1:250@A3

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- PH20 DENOTES SITE PHOTOGRAPH. SEE DRAWINGS 18003–

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Client. L B of TOWER HAMELTS

Architect.

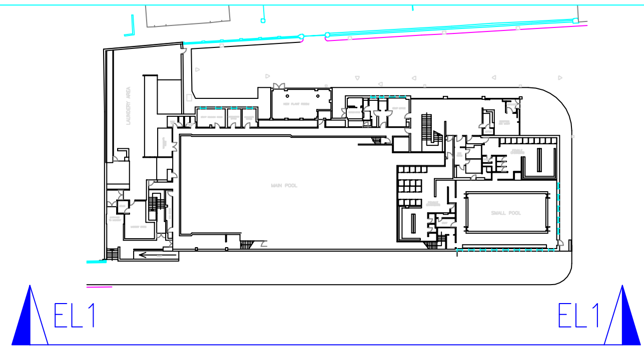
Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION SECOND FLOOR PLAN

Date. Aug'18		Drawn By.	JB
Scale. AS NOTED	Dwg Size. A3	Checked By.	NS

Drawing Status. RECORD

Drawing Number. 18003–301 Rev. R



KEY PLAN
N.T.S

NOTES:-

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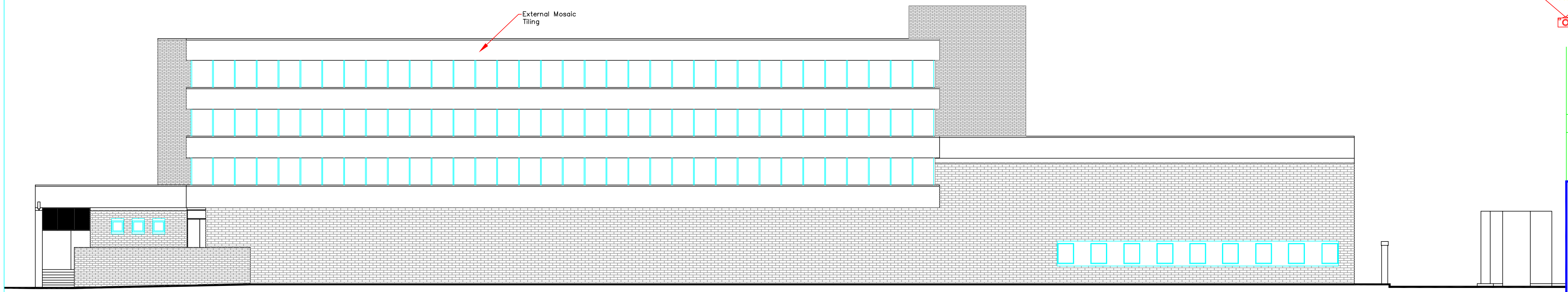
- SITE TESTING WORKS TO UNDERSIDE OF EXISTING CONCRETE SLAB OVER.
- PH20 DENOTES SITE PHOTOGRAPH. SEE DRAWINGS 18003–



ELEVATION EL1
ROAD ELEVATION
SCALE APPROX. 1:250@A3

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Architect.

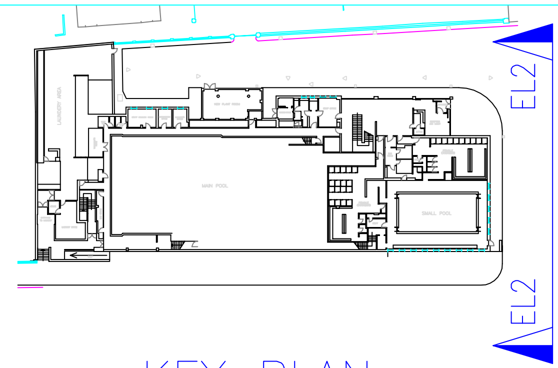
Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION ROAD ELEVATION – EL1

Date. Aug'18	Drawn By. JB
Scale. AS NOTED / Dwg Size. A3	Checked By. NS

Drawing Status. RECORD

Drawing Number. 18003–EL1 Rev. R



KEY PLAN

N.T.S

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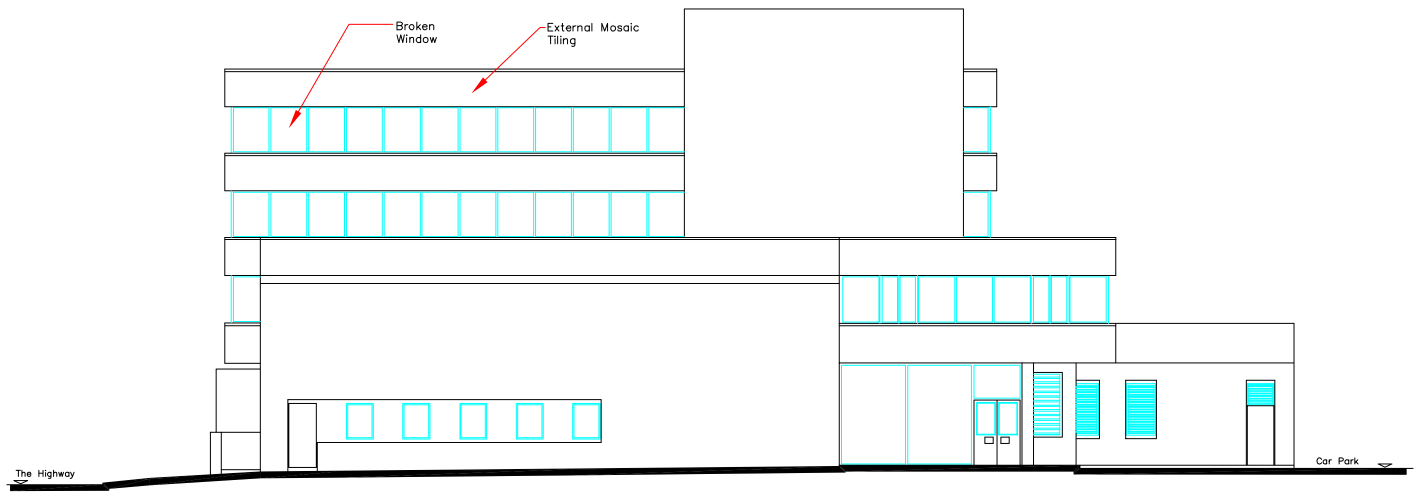
SITE TESTING WORKS TO UNDERSIDE OF EXISTING CONCRETE SLAB OVER.

PH20 DENOTES SITE PHOTOGRAPH. SEE DRAWINGS 18003-



ELEVATION EL2
VEHICLE ACCESS ELEVATION

SCALE APPROX. 1:250@A3

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Architect.

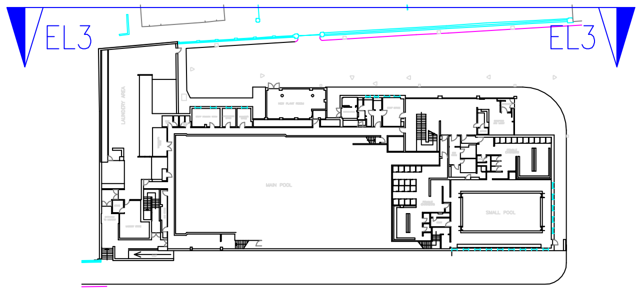
Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION VEHICLE ACCESS ELEVATION

Date. Aug'18		Drawn By.	JB
Scale. AS NOTED	Dwg Size. A3	Checked By.	NS

Drawing Status. RECORD

Drawing Number. 18003-EL2 Rev. R



KEY PLAN

N.T.S

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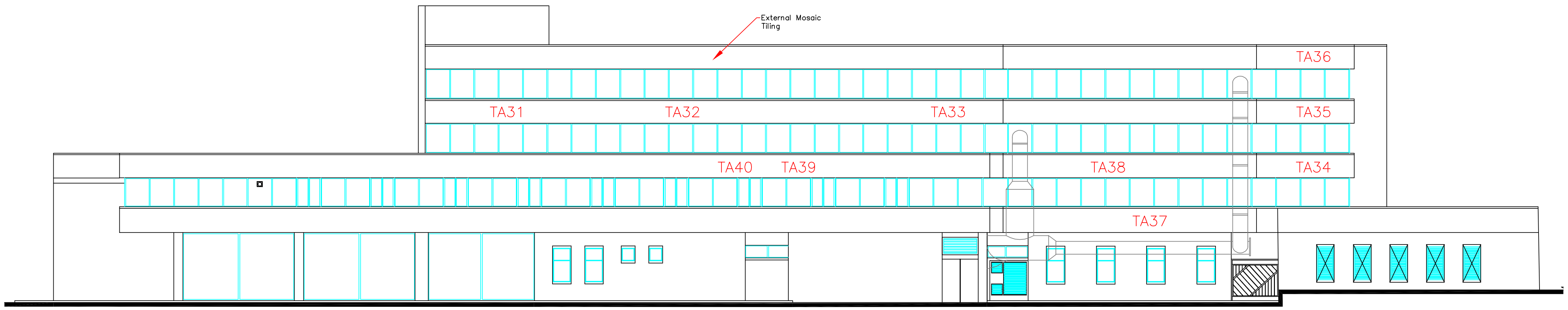
- PH20 DENOTES SITE PHOTOGRAPH. SEE DRAWINGS 18003–



ELEVATION EL3
REAR ELEVATION

SCALE APPROX. 1:250@A3

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Architect.

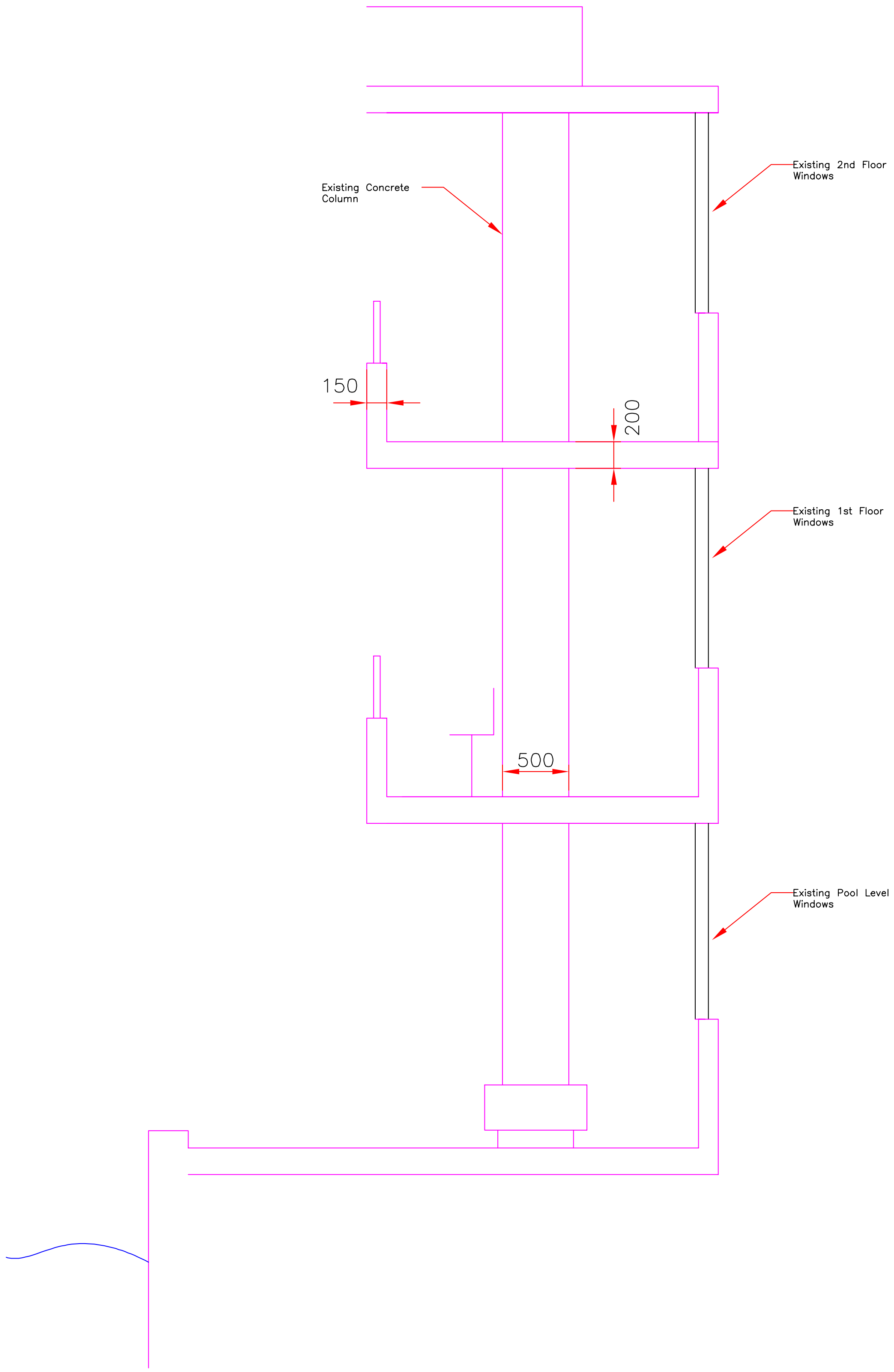
Project. St GEORGES POOL THE HIGHWAY LONDON E1

Drawing Title. STRUTURAL INVESTIGATION REAR ELEVATION – EL3

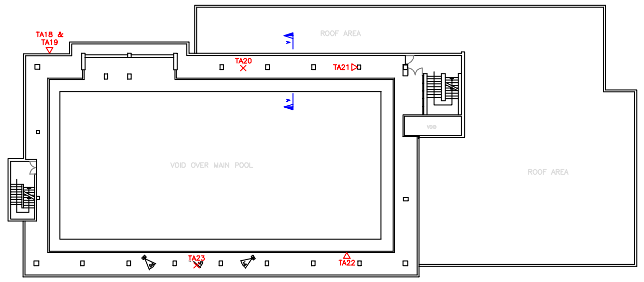
Date. Aug'18		Drawn By.	JB
Scale. AS NOTED	Dwg Size. A3	Checked By.	NS

Drawing Status. RECORD

Drawing Number. 18003–EL3 Rev. R



SECTION A–A
SCALE 1:50@A3



KEY PLAN
N.T.S

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PH20 DENOTES SITE PHOTOGRAPH. SEE DRAWINGS 18003–

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Drawing Title. STRUTURAL INVESTIGATION REAR ELEVATION – EL3

Date. Aug'18		Drawn By.	JB
Scale. AS NOTED	Dwg Size. A3	Checked By.	NS

Drawing Status. RECORD

Drawing Number. 18003–SEC–01 Rev. R