St. Paul's Cathedral in Kolkata, India

Restoration, Rectification and Maintenance plan

Individual study by Unmesh Kirtikar

as part of the SIDA course
"Conservation and Management of Historic Buildings"
conducted by Lund University, Sweden.

A brief history

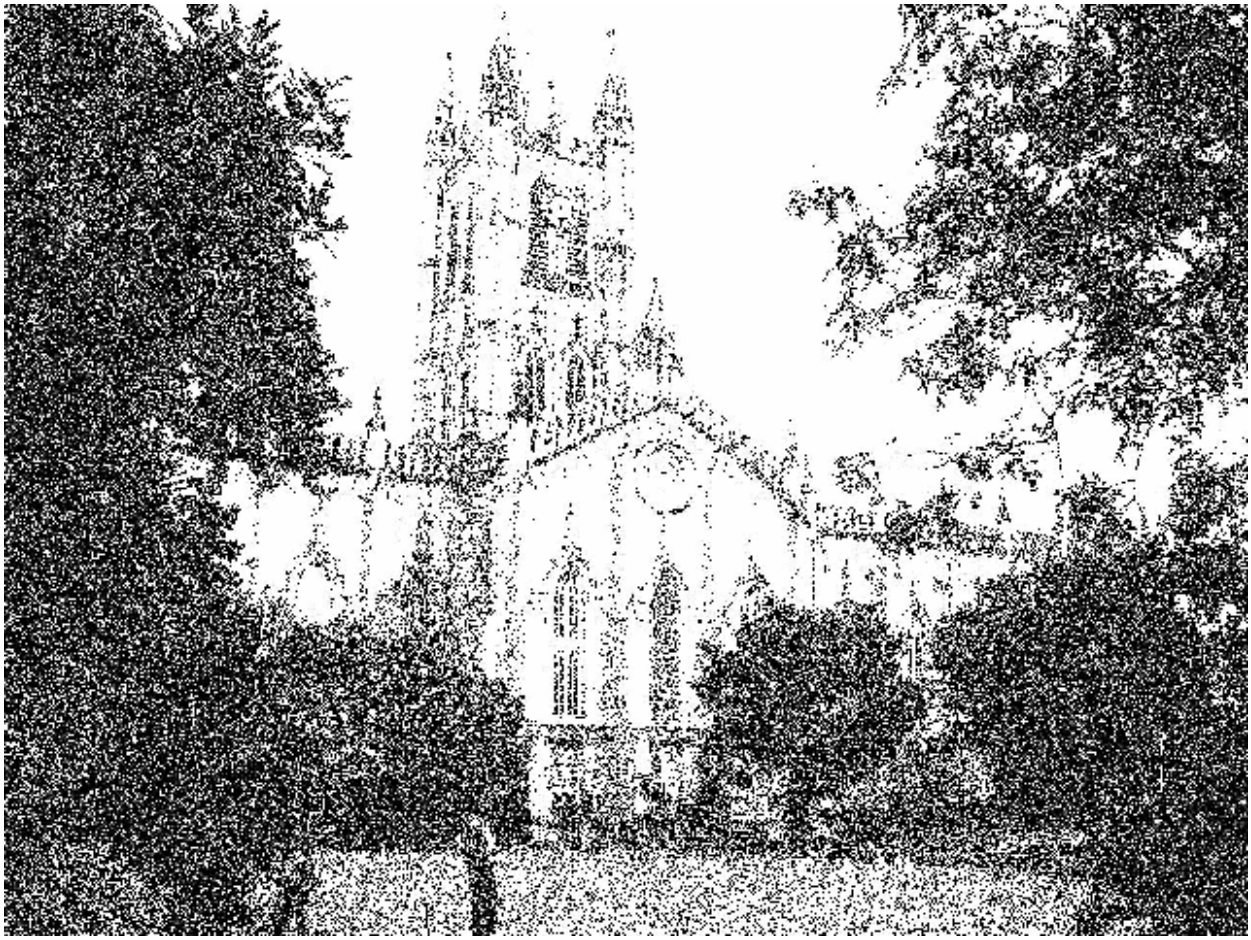
The history of the construction of St. Paul's Cathedral started 190 years ago. The First Bishop of Calcutta, Mr. T.F. Middleton, first initiated the proposal for the construction of this Cathedral. In 1819 plans for a Cathedral were submitted by Capt. W.N. Forbes. At a time when these plans were under consideration and revision, Bishop Middleton died. The scheme was then apparently dropped.

Bishop Heber, Bishop James and Bishop Turner, respectively the second, third and fourth Bishops of Calcutta, tried to revive the scheme, but their respective tenures were too short to

achieve any tangible result. Thus nothing more was heard about a new Cathedral for some years.

Daniel Wilson, who was consecrated as the fifth Bishop of Calcutta in the year 1832, publicly announced his intention to build St. Paul's Cathedral in 1839. A site of seven acres was granted for the Cathedral and the Bishop took formal possession of the same in June. The foundation stone of the new Cathedral was laid with great solemnity on 8th October of the same year, i.e. 1839.

As the building construction proceeded, the then Hon'ble British East India Company announced a grant of Rs. 150,000 in 1840. They however, stipulated that the seating inside the Cathedral should be provided for 800 to 1000 people. This promise of a large sum prompted enlargement of the Cathedral to provide for extra seating capacity. Finally, exactly eight years after the laying of the foundation stone, Bishop Daniel consecrated the Cathedral on 8th October 1847. Since then this Anglican Cathedral stood the test of time to become a National Monument and is still very active and functional having regular services for the large Christian community of the city.



Data about the property

Designation and ownership:

The Kolkata Municipal Heritage Committee in its heritage listing has identified the subject cathedral as a heritage structure of national importance.

The cathedral's ownership rests with the St. Paul's Cathedral Trust under the aegis of Church of North India through the Bishop of Kolkata as its custodian. The Trust is in full possession of

the entire seven acres of the cathedral property and is responsible for its maintenance and functioning.

Legal issues and framework:
Although the Heritage committee has been initiated with the task of listing the heritage buildings in and around Kolkata there is no proper legal framework in place yet to formulate the conservation / restoration guidelines. The listing only provides legal protection to the listed properties from demolition or any major alteration. The conservation movement being pretty new in Kolkata the process of formulating legal framework is in its gestation period currently. The municipal planning authorities are putting together various sub-committees to prepare a minimum interventional practice bill to be adopted and passed by the state legislature.

Usage:
The cathedral merits its position by virtue of its continuum as a full-fledged functional cathedral offering daily services in three different languages to the fairly large Protestant Christian community of Kolkata. Also being an active cathedral it has become a permanent entry item on the tourist map of Kolkata. The state as well as national tourism corporation distributes postcards and literature regularly.

Value analysis of the property

To determine the importance of this national monument it is imperative to acknowledge its value attributes.

Cultural Heritage evaluation:
The human settlement in sub continent of India is enriched with ever evolving cultural heritage and has strong pre-history as well as history from the original settlement of Dravidians (Indus valley civilization) to the advent of Aryans to the invasion of Alexander the great to the Mughal

incursion in early seventh century to the European (Portuguese, Dutch, French) settlers in 14th century and lastly the British colonialization in 17th century to the present day globalization. Unlike the other European colonies of the world India did not lose or dilute its cultural identity but grew with the addendums of different societies. Although there are vagaries of English colonial past yet there also are immense contributions to the present day cultural identity of the Indians in terms of arts, architecture, science and technology, religion, literature, etc. The Neo Gothic St. Paul's Cathedral is an excellent such remnant of the Anglican history of India's recent past. Architecturally the cathedral is a document of adaptive architecture of the time wherein the stylistic aesthetics of the west were adapted with technology of local materials as well as artisans. Due to continuity it also bears the patina of various time periods though short. The English were highly responsible for the spread and growth of the said Anglican Protestant Christian community in India, which continues to grow as of today. The active cathedral is a testimony of the same today. Kolkata, erstwhile Calcutta, was the seat of British Empire till early 20th century before being shifted to Delhi and the sheer size of this cathedral signifies that aspect intently. In summation one can say that although its life span is only about little over 170 years this cathedral does inhibit a semantic heritage value of city's recent history in as much that the city's history is only a bit over 300 years.

Functional values:

The main motive or function of St. Paul's Cathedral comes from the fact that it is an active cathedral serving the large Protestant Christian community of the city and its suburbs. The cathedral offers services in three different languages daily as well as for marriages, special functions and on important Christian celebrations. It is one of the largest cathedrals in the country and allows for a unified congregation of a large Christian gathering at one place. It continues to spread the Christian faith. The existence of this monumental structure also is functional in terms of providing an identity of place to the citizens. The site upon which St. Paul's cathedral stands by its sheer vastness of greenery provides with an environmental impact to the city's congested central area. The functional continuum of this national monument automatically reinforces its claim to be conserved and maintained for the benefit of the citizenry.

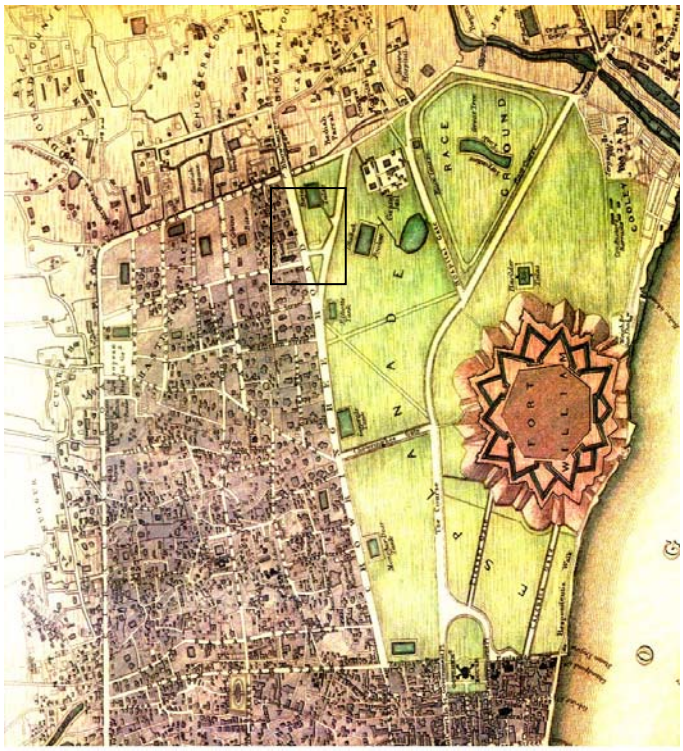
Economic value:

Apart from the intrinsic tourism oriented revenue generation opportunity the cathedral through its congregations generates funds for the Church of North India for its various philanthropic as well as faith propagation activities. The cathedral has the ability to periodically raise its own funds in phased manner for its conservation and maintenance. It is thus prudent to say that economically it is self-sustainable.

Choice of Ambition:

The choice of ambition for the preservation and periodic maintenance of the cathedral for its continued life is quite high in terms of its architectural and landmark values contributing to the urban image of central Kolkata.

Cathedral site in present day Kolkata



Cathedral site at the time of its erection

Location/ Situation

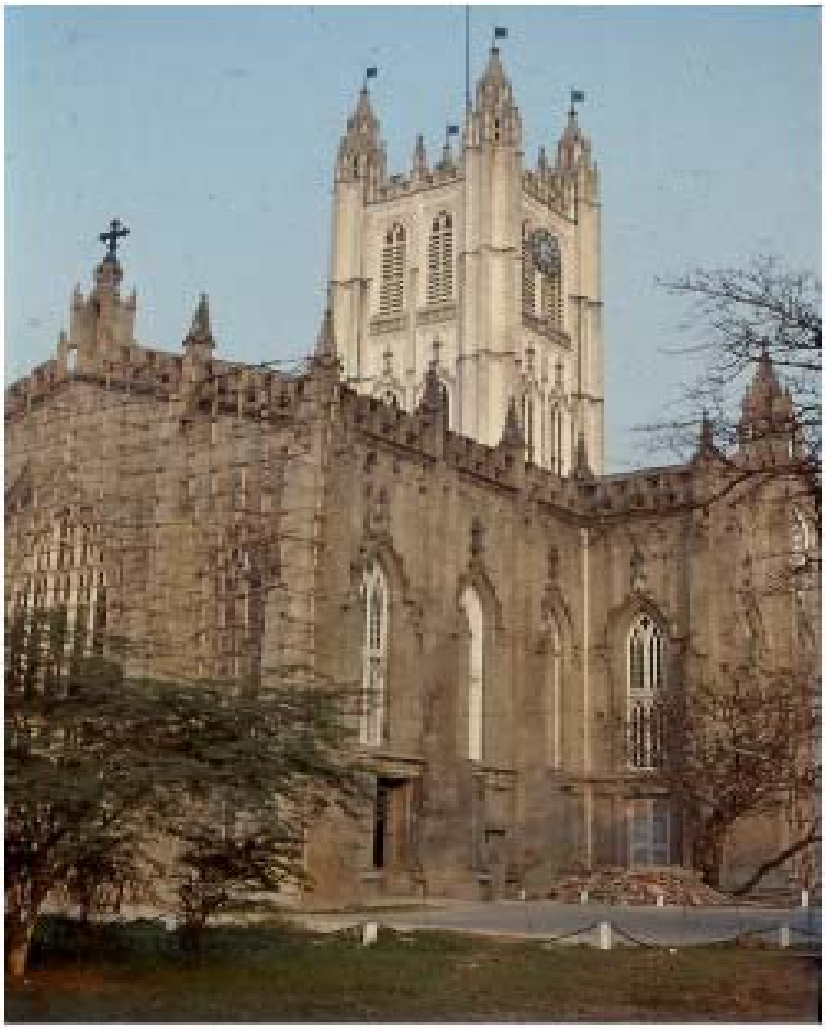
The object of study, St. Paul's Cathedral in Kolkata, India, identified by the author-participant is situated on seven acres of prime land in the heart of central Kolkata abutting on the now christened Cathedral Road on its west and across the famous Kolkata Monument of Victoria Memorial. On its east lies the extended business district of Kolkata along the major spine of the city, the Chowringhee Road, under which the city Metro transit runs. The southern boundary of the Cathedral is shared common with the cultural hub of the city that includes Academy of Fine Arts Galleries, Performing Arts Centre, Auditoria, etc. Towards northwest of the site lies the vast green maidans with its lakes and ponds. This green patch serves as the lungs of the city. The Birla Planetarium and The Calcutta Racquet Club abut on its north boundary. Overall the location of this national monument has been and is very vital in the context of the city of Kolkata.

Technical Charactereristics

The cathedral is predominantly a brick masonry structure and was built using local materials widely available in this part of the country at the time of its construction. At that time this region had abundance of skilled masons and was pioneer in exporting the same to the other parts of the country as well as overseas. Fired mud bricks still continue, as it was then, to be a major economical building material in this region. Thus it was a natural choice of material for the construction of the cathedral. The mortar used in the building is a mixture of lime and surki (brick dust), which was also prevalent at that time in this part of India. Wood and wrought iron are the other major materials used mainly for fenestrations, ornamentation, etc. Again the trade of carpentry and blacksmith was also very much prevalent here.

Progressive buttresses intermittently support the cathedral's high thick brick walls. The main roofing is vaulted brick spanning 21metres and a length of 71 metres. A steel truss with corrugated sheets was introduced at a later stage above the main roof mainly to provide protection to it from weathering. The external and internal plastering again has been done with

lime and surki mortar. The flooring is of stone slabs that were available in nearby quarries. The Gothic fenestrations are of timber framework with stained glass panels. Electricity was not invented at the time of its construction and thus the cathedral was not designed to accommodate such a utility. Later on during early 20th century the electrification of the cathedral was carried out.



Initiation of the renovation project

During the year 1990, the Trustees of St. Paul's Cathedral considered the importance of maintaining this National Monument so that it lasts for many more years to come. Pursuant to this decision, the Trustees decided to acquire expert opinion to find out ways and means to achieve the aforesaid goal.

The matter was initiated by inviting architects M/s. Kunjbihari & Sen, the firm in which the author-architect is one of the principals, to inspect the Cathedral in detail and to submit a proposal which, inter alia, should include the general approach to be taken to repair and renovate as required for the restoration of the Cathedral and to estimate its cost impact. A preliminary Report was thus prepared at the behest of the Trust.

Subsequently, the said architects were entrusted with the responsibilities of rendering all the requisite technical services to cover the renovation and restoration work in respect of the Cathedral.

Status of the building

The observations made on the present state of the Cathedral were as follows: -

i) General Building: -

It had developed dampness and saltpeter action at some places. Cracks were noticeable in the porticos and walls. The woodworks on the exterior sides appeared to be damaged. Plastering, painting, hardware, stonework, etc. were found to be deteriorated or damaged.

ii) Electrical Work: -

The main switches appeared to be damaged and the wiring had deteriorated. The lightning arrestors, necessary for such tall structures, did not appear to be sufficient and needed to be improved.

iii) Drainage System:-

The drainage system had deteriorated right from its collection point upto the sewer. The rain water pipes and spouts were broken at places. The surface drains required reconstruction and renovation. A proper connection with the Municipal sewer line was also required to be provided.

iv) Landscaping and Environment:-

These aspects did not seem to have attracted adequate attention. The structures that were subsequently erected within the Cathedral compound or the trees that were planted appeared to be somewhat disjointed and ill planned. There was scope for developing a comprehensive landscape to improve the environment and make it look more pleasant and attractive.

Observation

In order to assess the extent of repair and renovation, the author architect and his associates inspected the Cathedral on several occasions. A general and detailed survey was also made to ascertain the level of the building in relation to its surrounding roads.

No drawings or substantial technical informations were available except what could be extracted or inferred from the Minute Book, which was being maintained during the eight-year period of construction, i.e., 1839 to 1847. A few sketches were also retrieved.

The general condition of this 150 years old Cathedral was found to be reasonably good. No substantial record about the repairs and maintenance carried out earlier was available. However, it seemed that the structure was well maintained during the initial 100 / 120 years.

From a study it appeared that the following structures were added afterwards, but no record was available in its support: -

i) Portico and a room on the North side;
ii) Portico on the South side;
iii) Mild steel truss and asbestos sheet roof above the existing roof.

The joint between the second roof and the tower did not seem to have received adequate water proofing treatment.

It was also found from the past records that the Cathedral survived a few natural onslaughts. A big window lay abandoned for over 50 years in the chapter House at Windsor, U.K. This was shifted with the approval of Queen Victoria and fixed to the Eastern façade of the Cathedral in February, 1847, but was unfortunately completely destroyed by the cyclone that swept over the city on 5th October, 1864. Similarly the pinnacle constructed above the tower fell down during the great earthquake of Monghyr in 1934. The pinnacle had possibly cracked during lightnings and the earthquake accelerated its fall**.**

Proposal

The entire proposal had been thought of with a short term and a long-term view. The short-term view was to arrest further deterioration of the structure and to take all technical preventive measures available to avoid further damage or to avert any untoward happening. The long-term view was to regenerate the environment and to landscape the Cathedral compound adequately so that the Cathedral becomes more pleasant and attractive and continues to enjoy its outstanding stature as a National Monument for many more years to come.

Also it was proposed to study the effects of short-term intervention and rectify over the period of the second phase the shortcomings of such interventions since at the time of assignment of the restoration the knowledge base of the assigned architects was limited in terms of conservation principles.

It was proposed that the short-term measures should be the First phase and taken as quickly as possible and preferably within the current year. The long-term measures could be planned and implemented as the second phase over a more comfortable period of time.

EXECUTION – PHASE – I

I) The execution of phase I was done as follows: -

1. <u>To take out the external plaster:</u>

During the initial investigations it was assumed that only 15 to 20% of the external plaster might have to be removed. Detailed investigations while executing the job of deplastering revealed that at least 80% of the plaster would have to be removed, while the remaining 20% might have had a small residual life. It was therefore, decided that the entire external plaster should be removed and redone. Accordingly, the entire external façade was deplastered.

2. <u>To replace all bricks damaged by saltpeter action:</u>

Detailed investigations revealed that there were concealed rainwater pipes within the buttresses, which had got corroded and choked, causing leakage inside the masonry walls. This resulted in the development of saltpeter action in some of the adjacent bricks. All such pipes were removed, the affected bricks were replaced, and the voids created by the removal of the pipes were filled up with concrete.

3. To repair all cracks:

Two types of cracks were noticed during the inspections – minor cracks on the masonry walls, and major cracks between the western wall and the buttresses on the large western portico – making the buttresses almost free standing. Apparently the cracks on the western portico resulted from the enormous lateral thrust due to the large deck slab above the portico.

The minor cracks were treated with small concrete dumbbell stitches. The buttresses were stitched to the western wall with stronger concrete rings. Moreover, a dummy brick masonry wall was constructed adjacent to the western portico wall on the inside to take the lateral thrust from above, thereby considerably reducing the thrust borne by the existing wall.

The original Timber beam under the large window on the western façade was in a poor state. It was replaced by a set of steel joists, after cleaning them with acid and further treating the same with a weatherproofing and rust proofing epoxy resin compound.

4. To completely dismantle the Northern and Southern porticos and to rebuild the former as per the original:

This was necessary due to the poor structural condition of the porticos. At first it was decided to rebuild both the porticos but later, due to the non-functional nature of the Southern portico, it was agreed upon to rebuild the Northern one only.

The job called for a detailed measured drawing of the existing Northern portico before dismantling the same. The new portico was then erected without altering the plan, elevations and motifs of the original.

5. Redoing the external plaster work with proper weatherproofing treatment:

Replastering of the external surface of the Cathedral was done in two layers. The first layer of 20 mm. Thickness was applied with a rough texture. Thereafter, another layer of 6 mm. Thickness, mixed with a polymer based weatherproofing compound, was applied with a smooth finish over the previous layer. This was done to give better life to the external walls and to prevent seepage of water through these walls.

6. To replace broken sandstone slabs in the stairs:

Some of the sandstone slabs of the stairs in front of the entrances on the Northern side were found to be broken. These were replaced by new one.

7. To repair all external woodwork and to replace hardware, wherever necessary:

Most of the external woodwork viz. doors, windows and their frames were found to be damaged due to the weather. These were repaired and treated with a coat of polymer based weatherproofing compound before painting.

Hardware such as stair railings, door and window handles, hinges, etc. were replaced by new ones wherever necessary.

8. To clean the basement thoroughly, thereby providing a better ventilation system:

The basement was originally provided to facilitate ventilation and non-accumulation of moisture below the ground floor slab through tunnels running across the Cathedral from North to South. The Fenestrations to these tunnels were of cast iron gratings some of which got damaged or

lost over the years. Moreover, due to reasons unknown, these tunnels were filled up at some time.

The tunnels were completely opened, cleaned and ventilated in order to revive its original function. The fenestrations were provided with precast concrete gratings replacing the old damaged cast iron gratings.

9. <u>To check all electrical wiring, main switches etc. and replacing them where necessary:</u>

It was decided to redo the entire electrical work inside the Cathedral in phases. This work is currently under way.

10. <u>To provide proper lighting arrestors:</u>

The work to provide adequate number of lighting arrestors with galvanized iron strips is also in progress at present.

11. To replace all broken rainwater pipes:

Previously vertical concealed lead rainwater pipes were provided within the buttresses, which had gotten choked and corroded. Moreover, quite a number of rainwater outlets were through overhanging projected spouts and trays – which caused spillage on the external surface of the Cathedral causing dampness in the walls. This system was totally discarded and new exposed vertical rainwater pipes were provided along with new gutters etc. all along the roof connecting them to the open surface storm water drains running around the periphery of the building.

12. To repair all surface drains and to connect them to the Municipal sewer line:

The existing surface drains had become practically non – functional because of clogging due to poor maintenance, causing frequent water logging during the monsoons. These were cleaned, repaired and reconstructed, wherever necessary. A proper connection of this drain with the Municipal sewer line was also provided.

13. To paint the external facades:

Once the above-mentioned repairs were carried out, the entire Cathedral was painted with two coats of specially manufactured polymer based paint on its external surface.

Execution of Phase II

The execution of phase II is on going. Presently various schemes and options for landscaping of the Cathedral compound, illumination of the external facades of the Cathedral building, re-erection of a pinnacle over the tower are being considered and evaluated so that these can be implemented in near future. Remedial and correctional interventions to the evaluated errors on the choice of interventions done in Phase I is also within the ambit of Phase II.

Proposals for future Maintenance/ Additions/ Rectification

1. To take out the external cement sand plaster and redo the same with the original Lime Surki plaster:

(During the interim period between phase I and now it has been observed that the cement and sand replastering done during that stage was a wrong choice and it has resulted in inefficient bonding with the brick wall. Furthermore shrinkage cracks in it have also appeared. This operation can be taken up within next two to three years when the cathedral is due for external painting.)

2. To monitor whether further masonry cracks develop and to rectify them with steel clamp stitches rather than concrete ones as had been done earlier:

3. To rebuild the southern portico:

4. To introduce modern Fire Fighting facility:

5. To replace all broken rainwater pipes:

6. To periodically monitor and clean the ventilated basement:

7. To provide access to persons with different ability:

8. To constantly continue the process of re-documentation of restoration interventions carried out:

9. To execute and carry out studies on the impact of the environmental pollution on the cathedral:

(Being in the heart of the city where heavy vehicular movement is a permanent threat to the environment such a study has become a necessity.)

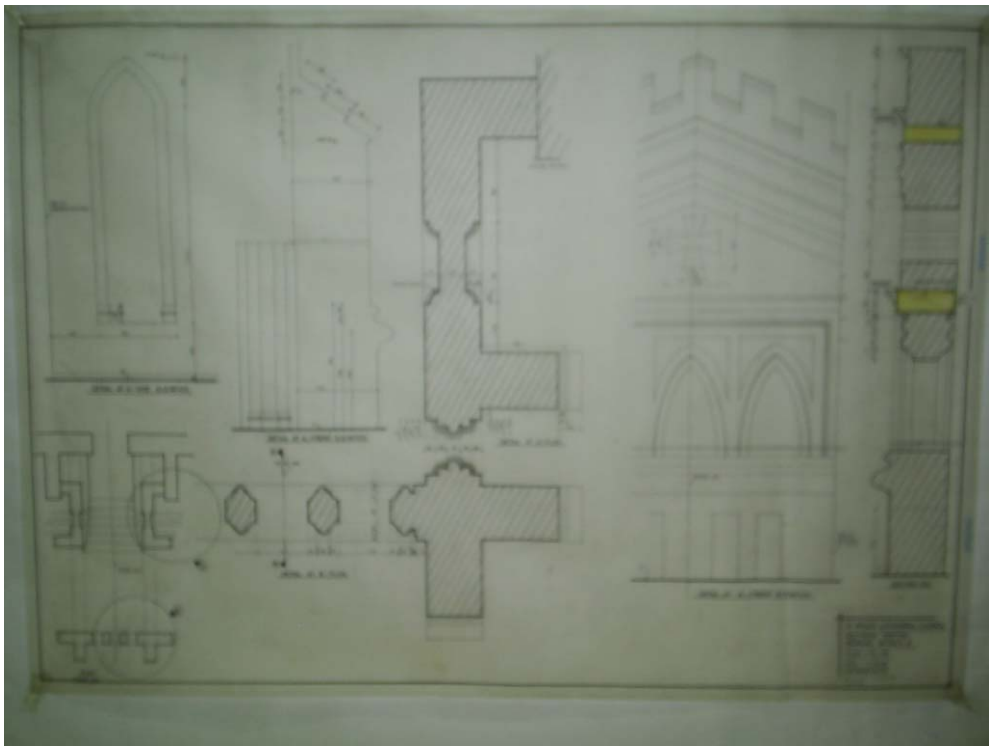
Conclusion

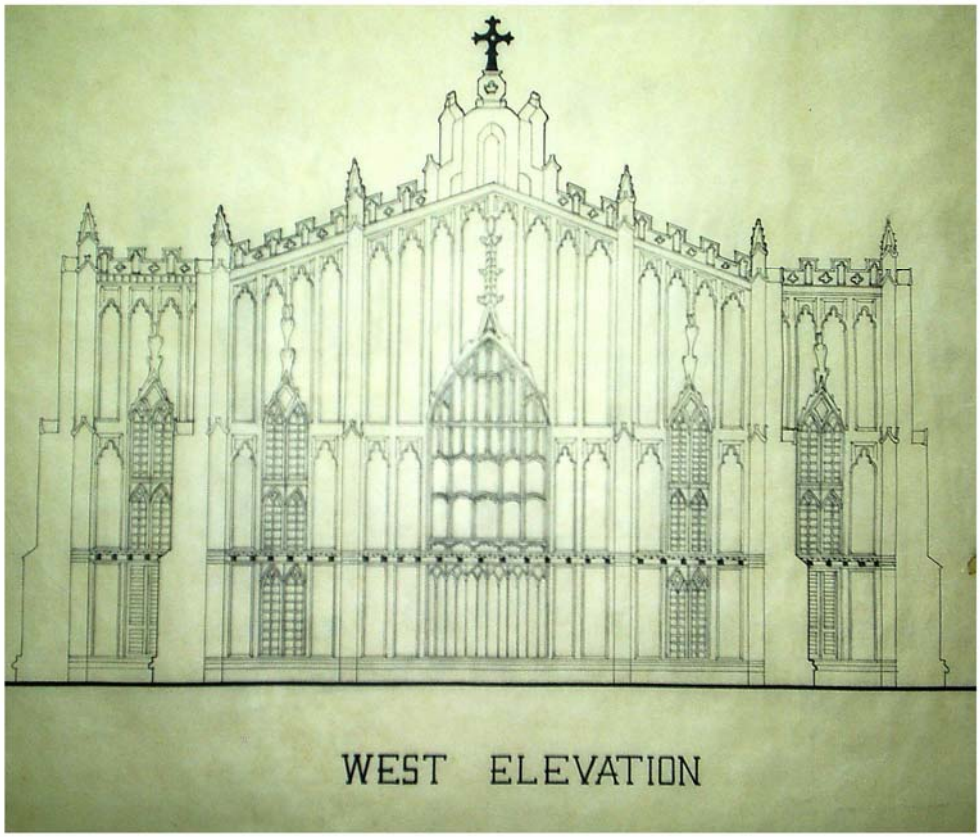
During the last century and a half of its existence the St. Paul's Cathedral has served the people and has gifted immense benefits to the general mass. The social benefits that the people will derive from the existence of this National Monument cannot be evaluated in figures and far outweighs the cost for its renovation and restoration.

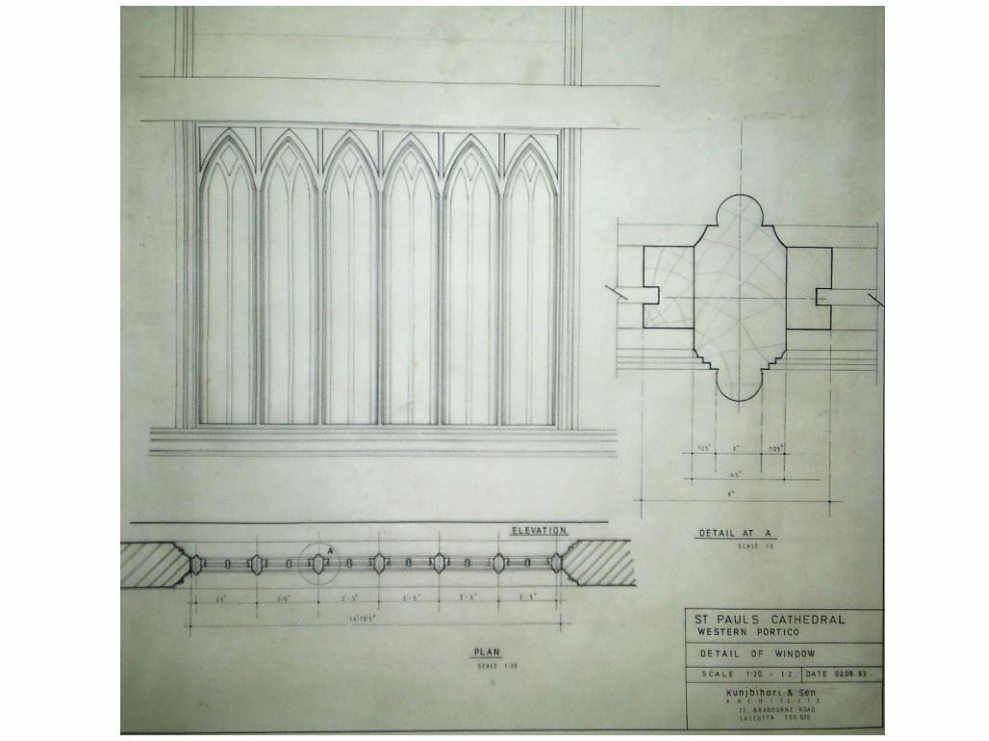
It may be reasonably and emphatically concluded that the St. Paul's Cathedral will continue to serve the community and is bound to remain a centre of attraction as a proud monument of history, a landmark in the urban scale for many more years to come.

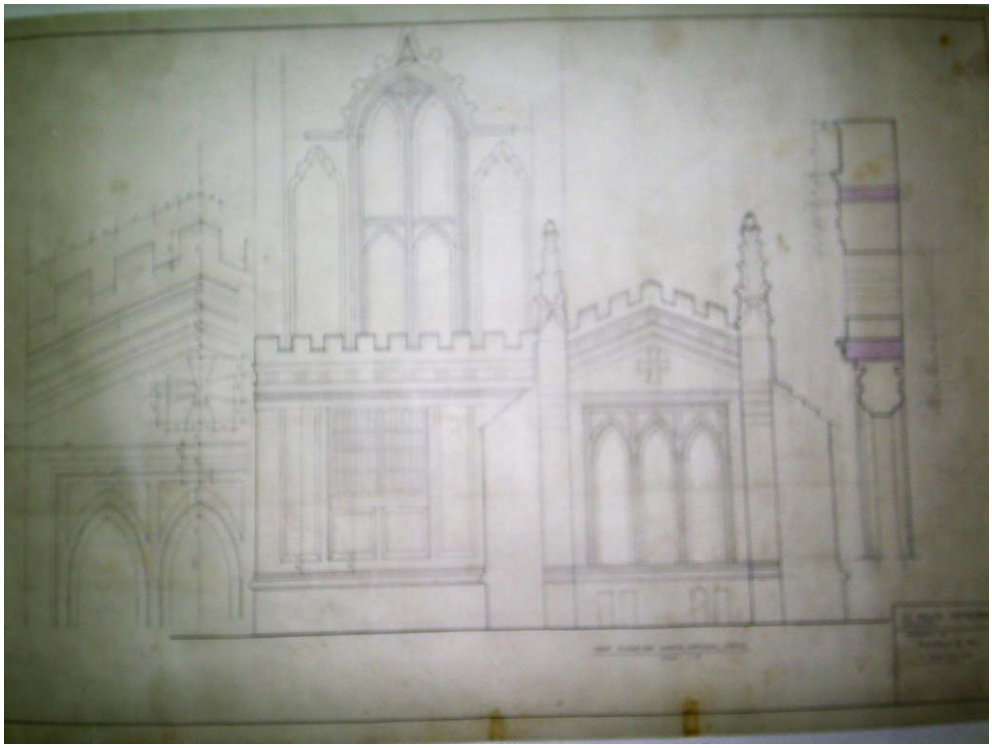
ANNEXURE

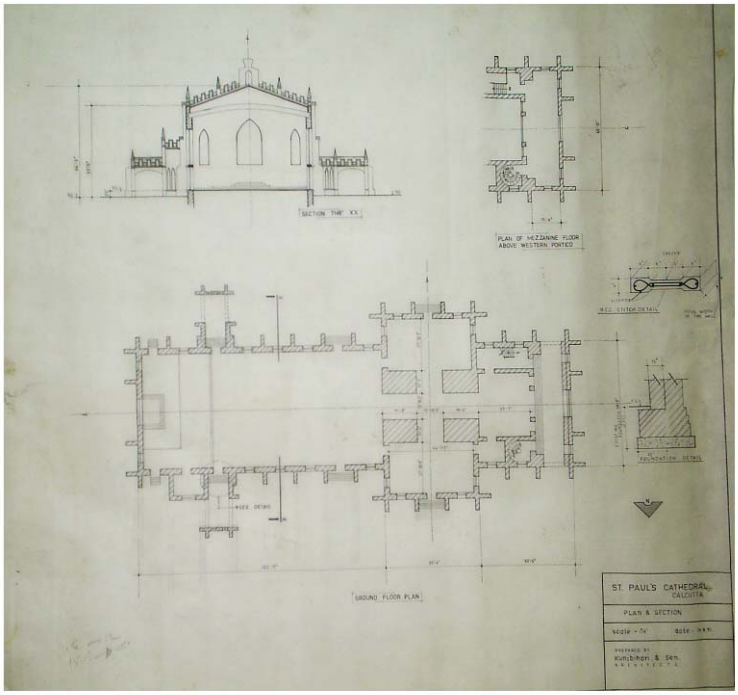
SOME DRAWINGS

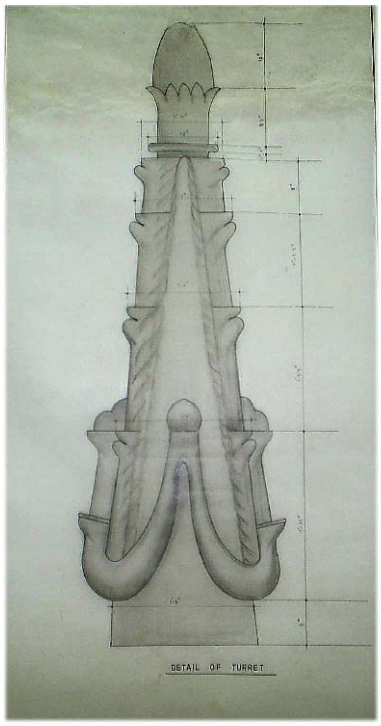


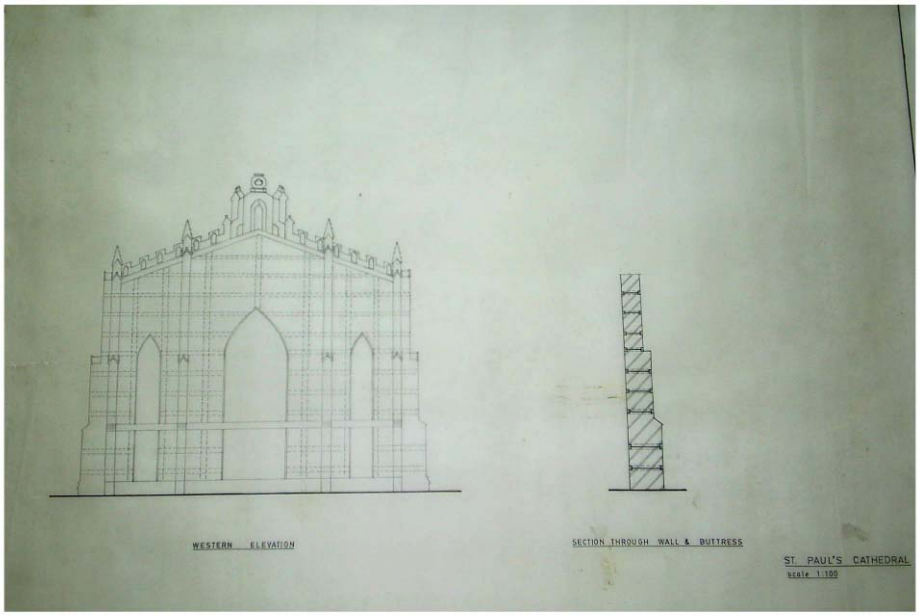

WEST ELEVATION

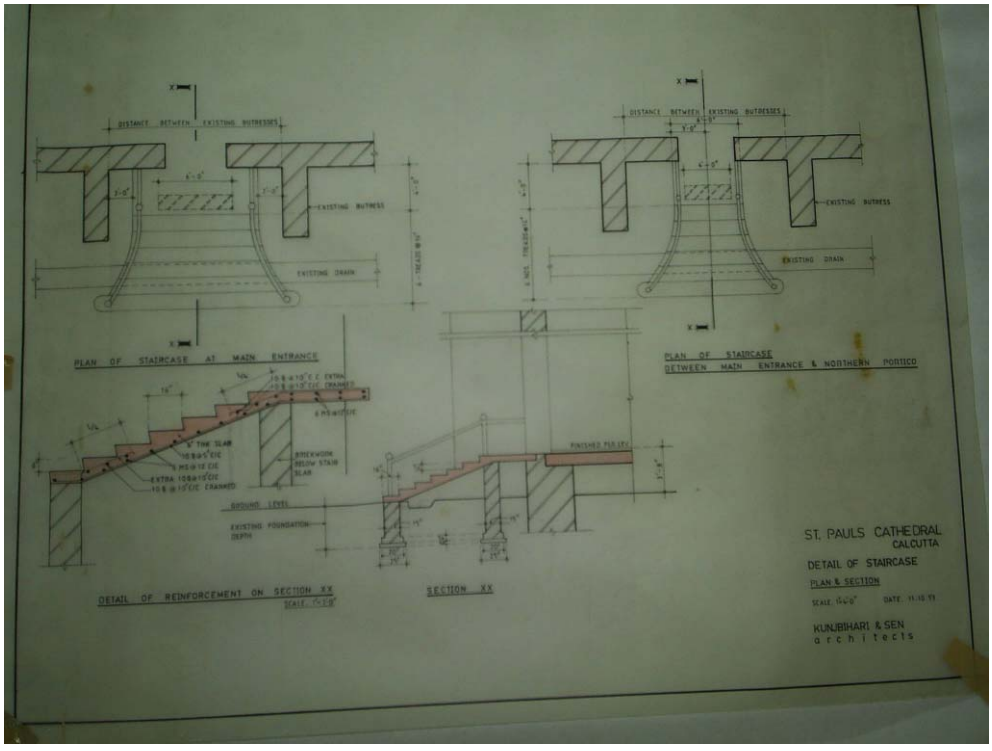

ELEVATION
PLAN
DETAIL AT A
ST PAULS CATHEDRAL
WESTERN PORTICO
DETAIL OF WINDOW
Kunjbihari & Sen

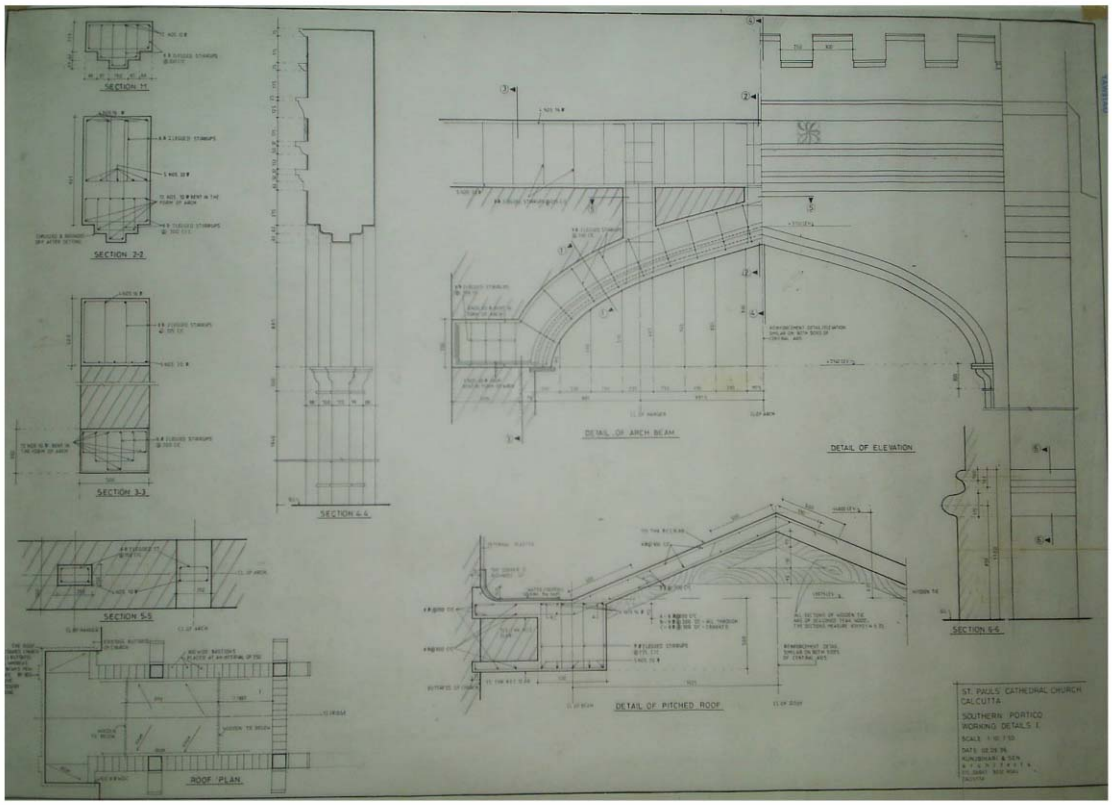



SECTION THRU' XX
PLAN OF MEZZANINE FLOOR ABOVE WESTERN PORTICO
GROUND FLOOR PLAN
ST. PAUL'S CATHEDRAL
CALCUTTA
PLAN & SECTION
Kumbleben & Son.


DETAIL OF TURRET


WESTERN ELEVATION
SECTION THROUGH WALL & BUTTRESS
ST. PAUL'S CATHEDRAL
scale 1:100


DISTANCE BETWEEN EXISTING BUTTRESSES
EXISTING BUTTRESS
EXISTING DRAIN
PLAN OF STAIRCASE AT MAIN ENTRANCE
PLAN OF STAIRCASE BETWEEN MAIN ENTRANCE & NORTHERN PORTICO
GROUND LEVEL
EXISTING FOUNDATION DEPTH
DETAIL OF REINFORCEMENT ON SECTION XX
SECTION XX
ST. PAULS CATHEDRAL
CALCUTTA
DETAIL OF STAIRCASE
PLAN & SECTION
KUNJBIHARI & SEN
architects


SECTION 1-1
SECTION 2-2
SECTION 3-3
SECTION 4-4
SECTION 5-5
ROOF PLAN
DETAIL OF ARCH BEAM
DETAIL OF ELEVATION
DETAIL OF PITCHED ROOF
SECTION 6-6
ST. PAULS CATHEDRAL CHURCH
CALCUTTA
SOUTHERN PORTICO
WORKING DETAILS I