Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 46 (1983)

Artikel: College and cathedral restorations
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DOI: https://doi.org/10.5169/seals-35863

College and Cathedral Restorations

Restauration d'une cathédrale et d'un collège

Die Restauration einer Kathedrale und eines Universitätsgebäudes

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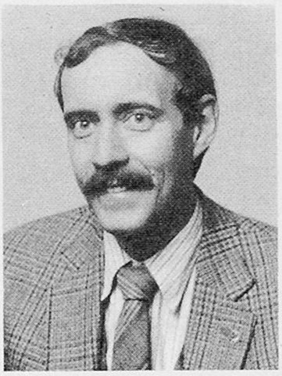

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SUMMARY

This paper is concerned with the work performed by the architects in the conservation of University College (1856, rebuilt in 1890) and the Cathedral Church of St. James (designed 1850-1868). Both buildings are located in Toronto. These are continuous conservation projects requiring restoration and renovation techniques. Both buildings have problems dating back to their beginning, problems of age and modern problems caused by a city environment.

RESUME

L'article traite de la conservation de l'University College (1856, reconstruit en 1890) et la Cathédrale de St. James (1850-1868). Les deux bâtiments sont à Toronto, Canada. Les deux projets sont des conservations continues exigeant les deux techniques de la restauration et de la rénovation. Les deux bâtiments ont présenté des problèmes dès le début de leur construction ainsi que des problèmes d'âge, et des problèmes modernes dûs à l'environnement urbain.

ZUSAMMENFASSUNG

Der Beitrag beschäftigt sich mit den Architektur-Arbeiten die im Zusammenhang mit der Restauration eines Universitätsgebäudes (1856, Neuerstellung 1890) und der St. James-Kathedrale (1850-1868) geleistet wurden. Beide Gebäude stehen in Toronto und befinden sich in einem ständigen Restaurationsprozess, um ihre Erhaltung zu gewährleisten. Die Instandstellungsprobleme bestehen seit der Errichtung der Gebäude und haben sich durch zeitliche Einflüsse und Umweltabänderungen verstärkt.

The two buildings discussed in this paper were designed by F. W. Cumberland, a most distinguished 19th Century Canadian Architect and an outstanding Toronto citizen. Frederic William Cumberland was an engineer by training and profession and had come to Canada in the mid 1840's from England where he had worked as an assistant Engineer in the building of the Great West Railway under the renowned engineer I. K. Brunel. Cumberland carried on two jobs, one as chief engineer for the new Toronto to Barrie railway and that of architect. In both jobs he excelled. University College was his last major building and on its completion he devoted all his time to the railway and to the public service, being elected to the first Legislature of Ontario in 1867.

In 1849 a fire had destroyed the original Church of St. James and Cumberland was appointed the architect to design the new building. Cumberland's associates for this building were G. Storm and Henry Langley and it opened for services in 1852 but the spire was not completed until 1874. The style is Early English Gothic and Cumberland's concept was based on the great fourteenth century parish churches of East Anglia and the Cotswolds. The chief material is yellow brick made from local clay with the stone trim and facings of imported Ohio sandstone. The main body of the church is 200 feet long by 84 feet high by 98 feet wide at the side porches. The spire, 324 feet high, is the tallest in Canada.

In 1978 we were asked to survey the Cathedral and to prepare a proposal for its renovation and restoration. Our proposal recognized that any work to be done must fall into one of two categories. Firstly, existing conditions or emergency repairs, which, if not done within a short period of time would adversely affect the structure and fabric of the building and secondly work of redecoration and general maintenance which would improve the appearance and aesthetics of the interior spaces but which could be postponed for several years.

One of the major problems we faced was a high level of humidity in the church. This humidity we concluded was caused by the high water table around the building, expecially in the spring and no proper floor slab in the basement side aisles and in the crypt. Moisture was being absorbed through the walls below grade. Above grade the brick had been cleaned a few years ago and the silicone had lost its effectiveness. This high humidity caused condensation damage to all surfaces, particularly walls and roofs. In the walls condensation resulted in plaster damage and flaking paint. Vapour migration to points of exhaust such as the nave roof, the tower, and the spire had caused timbers to decay and stone work to spall. In the roof, wood sheathing had decayed and the fasteners holding down the copper roofing had little or no strength which caused a serious problem during a windstorm in 1978.

An additional cause of the humidity, we learned, was a defective steam main. It finally ruptured outside the building but since it was installed in an 18" diameter barrel drain it allowed the steam to erupt in the Vestry of the church causing a fair amount of damage. The lesson to be learned from this experience is that if you are having difficulty controlling the humidity in an old building which depends for its heating on steam, check the steam mains very carefully. The breaking down of steam mains through corrosion both inside and outside the line can cause serious problems.

We cannot be sure we have discovered all sources of the dampness. Because of the age of the church most records of sanitary and storm drain locations have been lost. We proposed that the exterior walls be waterproofed down to the footings and as the work proceeded we were able to examine the condition of the storm drainage system. This proved to be a major contributor to the ground water problem as the drains were thoroughly plugged with decades of debris.

Additional corrective measures included a new slab with vapour barrier inside the church and, where the exterior walls were plastered inside we used a waterproofing type of plaster.

After a heavy windstorm resulted in damage to the spire and the roof it was obvious something urgent had to be done and we proceeded to make recommendations on the renovation of the building. The weathervane on the spire had been blown over and the decayed wooden base had to be replaced. On the downwind side of the roof the copper flashings and battens had opened at the seams and copper roof pans had been sucked out under heavy wind pressure. Scaffolding to repair the spire and roof was a major expense but it was not until scaffolding was in place that we could closely inspect the damage and make repairs.

Repairs to the damaged part of the roof were straightforward. The original copper was in excellent condition with very few cuts or holes. The roofer was able to reuse all of the flat sheets, replacing only the copper battens and some flashings.

The rotten roof deck was completely replaced using preservative treated wood. While the deck was removed we took the opportunity to insulate the roof and install roof vents. A vapour barrier was a major problem and there was some dispute as to whether an effective vapour barrier could be installed. It was subsequently left out. In monitoring the performance of this solution we have found a noticeable degree of condensation on the underside of the wood deck. Consequently, as we replace the remaining nave and side aisle roofs we intend to install a reinforced vapour barrier and to further improve ventilation of the installation.

Having completed the emergency roof and spire repair work we then undertook a structural analysis of the remainder of the spire. In collaboration with Morrison Hershfield, our structural engineers, we discovered that the steel beams supporting the bell chamber were severely corroded and that the wooden framing of the spire moved excessively under heavy wind loads. We had no alternative but to advise the owners of the danger that existed in the tower and spire. The 20 ton loading from the bells and the noise and vibration from ringing the bells presented a structural deficiency we could not ignore. We then proceeded to do a measured drawing of the spire and in collaboration with the engineers we designed a system of steel tie rods and gusset plates to stabilize a structure that had moved over 12 inches to the east and 8 inches to the south (under winds in excess of 50 m.p.h.) and put in a new steel frame from which we supported the bells. It still deflects slightly in the wind but is now tied into the masonry fabric and is no longer a threat to human safety.

To support the bells a new steel frame structure was built into the masonry above the existing bell frame which was then tied to the bell support structure with hanger rods with rubber pads to dampen the vibration.

From the bell support structure we ran vertical tie rods up into the wooden spire following the line of each of the 8 corner posts. In this manner the overturning moment of the spire could be transmitted down into the solid masonry base.

The remainder of the wooden spire framing was "stitched" together with gusset plates at every framing intersection and with cross bolts through the laminated corner posts.

It was a very complicated procedure further complicated by the irregularity to be found in a very old octagonal structure.

After repairing the roof and alleviating the humidity problem, we could resolve other problems in the restoration of this building. We have completely cleaned and repainted the interior, revealing enriched cornices and other detail. We have also protected the stained glass windows and improved the building energy efficiency. This work was broken down as follows:

1. Strengthening and stabilizing the spire.
2. Draining the crypt and resolving rising dampness.
3. Repairing outer stonework, tuck pointing and installation of storm drainage.
4. Sprinkler system in Cathedral for fire protection.
5. Upgrading of interior lighting.
6. Renovation of west nave and side aisle roofs.
7. Interior decorating, repairs and cleaning.
8. Fundraising and incidentals.

We have been working on this project for four years now and we have done much to restore a building which had been ravaged by time and a climate too severe for a building more suited to the temperate English cotswolds.

The second building I would like to talk about is University College, a building which is now a National as well as a Provincial Historic Monument. It is generally considered a fine example of Gothic-Romanesque architecture and its only peer in Canada is the Houses of Parliament in Ottawa.

The fabric consists of stone and brick walls, wood framed floors, slate roofing and copper flashing. Internally it has two superb timber roofed halls and three staircases of a richness and quality of craftsmanship not to be found even in the older universities of Great Britain.

Historical and Architectural Significance

University College is one of the very few pre-Confederation buildings of historical and architectural significance still remaining in Toronto. It was built between 1856 and 1859, when Toronto was the capital of Canada, and the then Governor-General, Sir Edmund Walker Head, played a large part not only in promoting the project as a whole but also in formulating many aspects of the architectural design. Historically, the construction of University College marked a decisive stage in the evolution of "the university question", which engaged so much of the attention of legislators in Canada under the Act of Union from 1841 to 1867. The controversy still continued but now it circled about a new focus.

The mere existence of the building did much to ensure the future of the University of Toronto and to shape it, in due course, into a federal pattern, which was later to be followed elsewhere in Canada and the Commonwealth. The architectural interest and merit of the building has been widely recognized from the day it was opened down to the present. As soon as it was completed, the building became one of the great showpieces of Toronto and, indeed, of Canada, and important visitors, such as the Fathers of Confederation, were invariably taken to see it. Formal recognition of the building's historical and architectural importance was granted in 1971 when it was declared a national historic monument by the Historic Sites and Monuments Board of Canada.

Use and Overuse

The building is far from being merely a monument. No building in the University of Toronto has been used more heavily over the years than has University College. No building is being used more today. For more than thirty years after it was completed in 1859, it was the University's only building. Even after other buildings had been added to the campus, it was still referred to as the "Main Building" and continued to house all the administrative offices of the University until 1922. It still stands as a symbol of the University of Toronto, although it is now used primarily by the more than 2,000 students of University College. But it is also used for many other University purposes as well - for lectures to students in other divisions of the University, for examinations, for instruction in the School of Graduate Studies, for evening classes offered by the Department of Extension, for classes in the Summer School. It was the very heavy use that the building had received over the years, and is still receiving, that accounted more than anything else for the very poor condition that most of it was in 1971. It is only necessary to see the thousands of students who pour through the corridors in any ordinary day in term-time to understand why the old wooden floors were in such lamentable shape. From its normal resources the University had done what it could to patch and repair and to deal with emergency situations. The electrical and mechanical services in the buiding were hopelessly out of date, the lighting poor, ventilation nonexistent, the fire-hazard was frightening, the interior colours and finishes were worn, dull, and depressing.

The Urgency of Renovations

The urgency for such a large-scale programme of renovation had been demonstrated by a number of things that came to light during investigations of the fabric. It had been revealed, for example, that the entire slate roof, together with the gutters and downpipes, had deteriorated through age to a point where dangerous damage was being caused by rain to the masonry walls and interior finishes, so that the roofing had to be replaced with the least possible delay. Another ominous sign manifested itself earlier. One spring day in 1967 when West Hall was being used as a robing-room for Convocation a large patch of plaster fell in one of the lecture-rooms beneath it. Investigation disclosed that the original beams that had supported West Hall since 1859 had twisted and loosened so that the whole of the floor of the Hall might well have collapsed under the weight of any large crowd. These particular wooden beams were replaced with steel. But no one could be sure that there were not similar situations elsewhere in the building. At about the same time, when part of the Cloister Wing had been stripped down to the original masonry, it became obvious that the whole fabric of that part of the building had been so weakened by alterations made over the decades to adapt it to changing uses that there was imminent risk of the bearing-walls giving way.

Planning

In 1966 the University appointed the late Professor Eric Arthur as the architectural consultant for the old main building of University College. Since then he and our firm of architects with whom he was associated, Wilson Newton Roberts Duncan made a thorough survey of the building, drew up plans for a comprehensive programme of renovation, and submitted recommendations about how the programme should be phased and carried out. All these plans and recommendations were carefully studied by officers of the Department of Physical Plant of the University and received their full approval. The objectives that the architects set for themselves, after consultation with the Principal of the College, in planning the work of renovation might be set down roughly as follows:

1. to reduce to a minimum the fire-hazard, while maintaing so far as possible the historic atmosphere and architectural distinction of the building;

2. to make the most efficient use of available space;

3. by minor structural additions, to recover most of the space that will be lost through changes in the interior lay-out to reduce the fire hazard;

4. to improve the services in the building, bringing them up to the present-day standards;

5. to make the facilities available to staff and students (includ-ing washrooms, which were then sorely inadequate) conform more closely to what is expected nowadays;

6. to protect and preserve a unique historic building for another hundred years of useful life.

Ontario Fire Marshal's Regulations

For a building built between 1856 and 1859 to be renovated successfully and satisfactorily it was necessary to seek some elasticity in the application of the regulations of the Ontario Fire Marshal and his colleagues in other jurisdictions.

The architects prepared a brief to the Ontario Fire Marshal outlining their proposals and the concessions they required. After substantial negotiations an agreement was reached whereby fire safety could be assured without destroying the quality of the building or making renewal impossible or impossibly costly.

In the subsequent renovations we replaced wood floors with concrete and steel, installed new staircases, installed new firedoors and a sprinkler and alarm system.

Other changes include new and efficient electrical and mechanical systems.

To blend these modern (and frequently drastic) changes into the fabric of the old building became the major problem.

The concrete floors now have new oak parquet floors in place of the old oak strip floors. While not the same, these floors restore the colour and atmosphere of the original without the sound.

The ceilings were dropped to accommodate the electrical and mechanical equipment. The original high ceilings are a blessing, but even so it was a struggle getting all the equipment in.

Where new doors were required the trim and panelling would be duplicated. If the door was a fire door, the hollow metal door would be panelled with wood and stained. They are usually indistinguishable from the originals.

Always we tried to maintain the original wainscotting. To conform with the fire requirements we would strip the original finish and then would stain and refinish with a fire retardant varnish. Many samples of the finish are required each time before a suitable colour can be obtained. The fire retardant finishes have a different character from the original shellac or varnish finishes. When new wood is present the new finish seldom matches that on the old wood. The glossiness and transparent depth of the finish is important and can be affected by the order and manner in which gloss and satin (or satin and gloss) coats are applied.

The new staircases were another challenge. For fire exits, we could not use wood and duplicate the other staircases. We turned to stone for the treads and wrought iron, for the balustrade and used an oak handrail. The doors go through where windows or doors originally were, thus allowing us to preserve original trim and stonework. Where a window had to be closed up we left it exposed and recessed the masonry slightly (leaving it exposed) thus leaving the history of the building visible.

Outside the new brick colour is a compromise between the existing uncleaned brick colour and the colour of the brick if it were clean. Result: it blends in very well.

Mechanical & Electrical

The mechanical and electrical requirements necessitated some drastic measures. Because of the size of the building the college has three mechanical rooms. For two of these rooms there was insufficient space. The solution: bury them. The college is surrounded by earth berms. We selected areas where flagstone terraces or patios already existed, dug them up, built the mechanical rooms and replaced the terraces almost exactly as they were before.

In one case, access to the mechanical room was required from two separate areas. We managed this by trenching under the basement floor and covering the resulting trenches with access covers.

New Uses, Adaptations

Much of the basement area of the college consisted of dark, dank and avoidable seminar rooms, storage rooms, electrical rooms and even inaccessible rooms. A vast resource!

The whole was made habitable by dampproofing the exterior walls and enlarging the area wells outside. Coupled with improved lighting and ventilation and by improved access we have just about added a new floor to the college.

Some seminar rooms were modified for audio visual uses by means of adding wood shutters to the inside of the windows and new wiring in the floors and the walls. By this means, we obtained two additional language laboratories, two new theatre-type lecture rooms, plus various seminar rooms and offices.

Conclusion

Throughout, our objective has been conservation wherever possible. We restore where parts are badly damaged. And we recycle, or modify, when modern needs and requirements demand it. Always within the context of, and in sympathy with the old building.

It has been possible in each case to preserve the character of the old building and to unobtrusively improve its efficiency, safety and comfort.