Mies van der Rohe, Carr Memorial Chapel, Chicago, Illinois, 1952. Restored chapel sanctuary with brick wall washed with western light. © Harboe Architects, 2012.

Restoring the "God Box": Mies van der Rohe's Carr Chapel at IIT

BY GUNNY HARBOE

Perhaps no building designed by Mies van der Rohe better exemplifies his dictum, "less is more", than Carr Chapel. Its rectangular prismatic form and unadorned architecture led to its being called "the God Box" by the students it served at the Illinois Institute of Technology (IIT). When a building is so simple and direct, every little detail needs to understood and attended to with great care in its conservation treatment. Combined with a chronic lack of funding, a seemingly simple project can become quite challenging and take over a decade to complete.

As with many heritage conservation projects the restoration of Mies van der Rohe's Robert F. Carr Memorial Chapel of Saint Savior (Carr Chapel) was many years in the making. Funded by the Chicago Episcopal Diocese in honor of Robert Franklin Carr, Carr Chapel was intended to serve the broader student community at the Illinois Institute of Technology (IIT). Though the building was quite simple in its conception of design and the execution of its construction, its restoration was challenging. With something as simple and direct as Mies van der Rohe's architecture, any intervention is difficult. While there was nothing particularly extraordinary or innovative required from a technical point of view, the execution had to be completed with great skill and extra care. The project was made even more difficult by the lack of funding available. The rich legacy of buildings that remain on the campus of the IIT is a treasure greatly valued by the University, however money is always hard to come by, especially for major renovation projects such as what was needed for the restoration of Carr Chapel. To that end, the Mies van der Rohe Society was formed to raise funds specifically for the restoration and preservation of the many Mies van der Rohe buildings on campus. The first project was the exterior restoration of S. R. Crown Hall followed by the restoration and renovation of Wishnick Hall. Carr Chapel was identified as the third project needing the Mies Society's attention.

Originally completed in 1952, Carr Chapel had long suffered from deferred maintenance and by the year 2000 was in need of major repairs. Unfortunately, IIT had no money to fund a restoration project at that time. In order to gain a better understanding of the true condition of the building and to begin to plan for its eventual restoration IIT commissioned the author to prepare a condition assessment for the building in 2001. This included some preliminary research and a full condition assessment of the existing conditions as well as recommendations for its future conservation treatments. This document served as the basis for the eventual restoration but was supplemented with further research for the development of full construction documents a number of years later.

The restoration itself had to be conducted in several phases as funding became available. It began with the roof, exterior masonry, and steel and glass curtain walls. Several years passed before enough money was raised to begin on the interior. All in all, it took about 15 years from the time it was recognized that Carr Chapel needed conservation until the time it was completely restored.

The Original Design – "Less is More"

Carr Chapel was Mies van der Rohe's only built ecclesiastical building (figure 01). It is said he had always wanted to design a cathedral, but this modest chapel was his only opportunity to create a worship space. At the dedication ceremony, he said: *Too often we think about architecture in terms of the spectacular. There is nothing spectacular about this chapel; it was not meant to be spectacular. It was meant to be simple; and, in fact, it is simple. But in its simplicity it is not primitive, but noble, and in its smallness it is great, in fact, monumental. I would not have built the chapel differently if I had had a million dollars to do it*[1].
Its simple design and rather small size led to Carr Chapel becoming affectionately known by the students of IIT as "the God Box".

Having sufficient funding to carry out any project was an underlying condition at IIT even at the time Carr Chapel was originally built. Although Mies van der Rohe claims he wouldn't have done it any differently even if money had not been limited may have been a rationalization after the fact. Mies van der Rohe's original design for the chapel had been a bit grander than what was eventually built. It appears he began on the design in 1949 and there was to be both a chapel and a parish house. The original chapel scheme was a bit larger, 72 x 52 foot (22 m x 16 m), and had exposed interior steel columns enclosed by solid walls of brick with openings of glass at either end[2]. The ceiling was to be plaster hung from the steel framing and there was to be a small mezzanine over the entrance. It is not known why this scheme was not the one built, but it is assumed the lack of funding played an important role. In any event, it was a much more modest scheme

that was constructed. The chapel was reduced to 60 x 37 x 19 foot (18 m x 11 m x 6 m) and the mezzanine, plaster ceiling and entire parish house were eliminated.

Structurally the building was also simplified resulting in exposed precast roof planks supported on a grid of steel girders and secondary beams painted with black Detroit graphite paint. The steel grid rests directly on solid masonry bearing walls three withes[3] thick in an English bond pattern. The brick is the same yellow iron spot brick Mies van der Rohe had used on all the other buildings at IIT, but in this case it was used as a true bearing wall, not as infill as he had done on the other buildings. The floor is a simple concrete slab on grade with embedded radiant heat and a black terrazzo topping. It steps up 5 inches (13 cm) to the altar and the rooms beyond. As with many of Mies van der Rohe's IIT projects, symmetry plays an important role at Carr Chapel. It was designed to be perfectly symmetrical along the east/west axis. The resulting architectural volume reads as a simple, single open space with a solid block of travertine serving as the altar. Its directness and simplicity makes it feel both primitive and refined at the same time: a clear manifestation of the Miesian adage "less is more".

There was minimal woodwork that consisted of simple oak veneered plywood panels and similar oak veneered slab doors. A simple oak bench was cantilevered off of the masonry wall on either side of the altar. It was a simple and practical element but was beautiful in what it did to the wall. Mies van der Rohe had also designed additional woodwork for the sanctuary that included screen walls that were to be located immediately when you entered the space and a series of wooden pews for seating. These features were both eliminated during the original construction phase.

The window walls were also designed to be quite simple. They were made from a light steel frame painted black, with a single pair of aluminum doors in the center. The glass of the entry wall was clear polished plate glass and that of the rear was all sandblasted glass, presumably to provide a more diffuse and even illumination from the western exposure. There was no clear line of sight of the west window wall from inside the sanctuary. Rather, the light would pour in and bathe the plain yellow brick walls with a glow of light. At night, a similar effect would be created by illuminating the walls with a wash of light from a series of spotlights concealed up above the lower flanges of the ceiling girders.

There was a late change to the fenestration of both the east and west elevation that must have occurred during construction as the windows shown on the construction drawings were not what was actually built. There were to be two sets of hopper windows on the west elevation; one set at the floor level and one set that ran above the doors which would have been just above the ceiling of the sacristy. Their locations were changed so that one set was located just below the sacristy ceiling and the other all the way at the top of the wall. The upper sashes were operated via a hand crank that opened all the windows in unison and still functions that way today. The front façade was originally designed with no operable windows but was built with a row of operable sash just above the level of the doors. It is not known why this change was made, but it was certainly a better technical solution for allowing good cross ventilation in the warmer weather.

The wall behind the altar was made of simple unpainted concrete masonry units (CMU) and was covered with a full height curtain of natural shantung silk. Evidently, there was some discussion about what color the silk curtains should be and Mies van der Rohe asked Gene Summers (the project architect and one of Mies van der Rohe's most important employees) to make a number of watercolor studies using different colors. He also ordered physical samples of four different colors, light brown, light green, purple madder and natural. They met with the Bishop in the chapel space to discuss it. As Gene Summers relates, "The Bishop favored the purple and Mies the natural color. The reasoning of Mies was as elegant as the silk. 'The people must be the color, the building and its parts must only provide a subtle background for the services and those words of the service'"[4]. This again reinforced Mies van der Rohe's belief that "less is more".

The area to the west of the curtain covered wall was dedicated to two small spaces intended to function as a sacristy and a choir room each with its own set of storage closets. There were also two small toilet rooms and a janitor's closet. Ceiling heights in all these spaces were very low at 7 foot-4 inches (2.22 m) with a loft space above. Originally this loft space was left open and unfinished but at some point, in the 1960s, it was filled almost entirely with a large box like construction to house the pipes of the organ. This giant box extended almost all the way to the steel and glass curtain wall which blocked nearly all the sunlight coming in from the west. This greatly diminished the original beautiful effect of light washing on the brick side walls.

The Restoration

The restoration project began in earnest in the summer of 2008. The roof had long been the cause of many leaks. This was largely due to the fact that there was an extremely low roof slope and only a single roof drain located in the center of the roof just west of the wall that separates the sanctuary from the back of house spaces. There was also no access to the roof from inside the building, which meant that to get up there to conduct routine maintenance such seasonal cleaning of the roof drain or inspecting the roof for potential leaks was seldom, if ever, done. As a result, leaves from the adjacent trees would block up the drain and water would pool on the roof. Left to sit there for too long, the water would eventually find its way into the building. This resulted in long term problems in some locations such as staining and deterioration the precast concrete planks. There was even the buildup of calcium deposits on the terrazzo floor created from the slow but steady drip, drip, drip of the water.

Additional water infiltration occurred at the perimeter of the roof where there was virtually no flashing detail at the roof's edge. The roofing material simply terminated at the top flange of a large steel "C" channel that was welded together to create a continuous steel ring at the top of the masonry walls. Not only did water infiltrate along the inside edge of the top flange, but it also penetrated at the caulk joint between the steel channel and the top of the masonry

01 Mies van der Rohe, Carr Memorial Chapel, Chicago, Illinois, 1952. Historic view of east façade. © Hedrich Blessing, 1952.

02 Mies van der Rohe, Carr Memorial Chapel, Chicago, Illinois, 1952. Looking west at the restored chapel. © Harboe Architects, 2011.

wall (figure 03). This resulted in water infiltrating into the solid masonry wall from the top down and the blooming of efflorescence on the inside walls, particularly in the corners. Although this detail was simple in concept and aesthetically elegant, thus holding true to Mies van der Rohe's design philosophy of "less is more", in this case, "less" was not enough.

At some point previously, there had been an attempt to address the lack of flashing by the addition of a simple aluminum sheet flashing that lapped over the roof edge and came down over the face of the steel channel about five inches (13 cm). This was a cheap and inelegant solution that also resulted in some surface deterioration of the steel channel likely due to galvanic reaction of the aluminum with the steel. To restore the original design intent of a simple clean line of the "C" channel and to try and provide some additional slope to the roof, a steel angle was added to the top of the flange of the channel. While this did add an extra line to the top of the roof, it is set back as far as possible and is only visible when some distance back from the building. The original clean line of the top of the "C" channel has thus been restored, and several additional inches of insulation were added that not only provides a higher R value to the roof, but gives more slope away from the roof edge and reduces the risk of standing water on the roof (figure 04). A new PVC roofing membrane was then installed which has been performing well.

There was additional efflorescence present in other areas of the interior surfaces of the walls that could not be explained by water penetrating at the top perimeter of the walls. It appeared that water was somehow coming in directly through the wall. Testing of the original mortar showed that it was extremely hard with a large amount of Portland cement. A simple RILEM water test revealed that the wall was highly porous at the mortar joints with many routes for water to get in. It is believed this may have been a result of the manner in which the masonry was laid up originally with a cold joint having been created where the original masons would stop and restart the work each day.

Other masonry problems consisted of numerous cracked or broken bricks. There were a couple of particular problem areas at the upper corners of the east façade. It was evidently a long-standing problem as the bricks in this area had been replaced at least once before. The newer brick was a poor match and the repairs clearly stood out. There was also a very peculiar vertical crack in the south wall at roughly the two-thirds point. The crack was present on both the outside and the inside of the wall. The crack ran quite vertically and had broken right through many of the bricks of the English bond pattern. The exterior crack had been ground out and repointed at least once before which had resulted in a rather ugly vertical line that disrupted the otherwise monolithic pattern of the wall. Several bricks were extracted to try and determine the underlying cause of the cracking. It was discovered that there was a large 4 inches (10 cm) diameter galvanized steel pipe buried in the wall. It is not known why this pipe was in that location in the wall as it did not appear to serve any function. It was in fact empty. Therefore, the pipe was removed and the wall repaired. The entire building was repointed with a softer mortar in an attempt to remedy the general water penetration through the cracks in the original hard mortar.

Finding a good match for the brick proved to be very difficult. Although all the buildings at IIT were originally built with a very similar yellow iron spot brick, each building is a little different. This has proven true even when the brick was made by the same manufacturer but the buildings were constructed a number of years apart. Fortunately, there had been some work done on one of the Mies van der Rohe student apartment buildings nearby that had required the replacement of the brick infill under the windows. That brick had been removed and totally replaced with new brick. Some of the original brick had been salvaged, and proved to be almost an exact match to the brick of Carr Chapel. It was certainly closer than anything else that could be found on campus or that was offered by current brick manufacturers. Luckily, although there was a very limited quantity available, it proved to be just enough for the replacement brick needed for the job.

The last major component of the exterior restoration dealt with the steel and glass curtain walls at the east and west elevations. They are identical in size of the overall openings, but are different in their articulation and glazing materials. The front (east) elevation used clear ¼ inch (6 mm) polished plate glass and the rear (west) elevation used ¼ inch (6 mm) polished plate glass that was sandblasted to provide diffuse

light. Both glazed elevations are divided into thirds, with the central bay containing a pair of aluminum doors.

On the east facing entry façade there are also three large gray granite slabs that form the entry plinth. This is the same detail Mies van der Rohe had used some years earlier at the entries to Alumni Hall. The granite was installed about 6 inches (15 cm) above the sidewalk and butted directly against the bottom of the curtain wall. Years of using de-icing salts at the entrance had taken a toll, and the steel along the bottom of the curtain wall was severely deteriorated. The drawing detail of this location showed that the steel framing went even further down and was embedded in the concrete slab. In order to get access to the steel elements, the three large granite slabs had to be removed fully exposing the extent of the deterioration. Although replacement is always a conservation treatment of last resort, it was clear that the existing steel at that location was beyond repair and had to be replaced.

Fortunately although all the other steel of the curtain wall did exhibit some corrosion, it was fully restorable. Steel is amazingly repairable and while something might look beyond repair, it can often be simply cleaned up and prepared for painting provided the section loss of the member is not too great.

In order to satisfy the modern building codes, the original ¼ inch (6 mm) polished plate glass had to be replaced with 3/8 inch (9 mm) tempered glass in the lower lights and heat strengthened glass in the operable sash and large upper lights. Although there is always concern about the distortion tempered glass can present, the appearance of the glass provided is quite good. The original operable steel sashes were removed, restored and reinstalled. All original hardware was retained, restored and reused. An attempt was made to restore the original aluminum doors, but the long term corrosion had caused deterioration to the operational aspects of the door. The cost for full restoration was deemed to be too much and the doors were replaced with new ones that closely matched the originals.

The large granite pavers that were removed to gain access to the bottom of the curtain wall were reinstalled in their original location. The 6 inches step up was deemed to be an unacceptable barrier to people with disabilities. Therefore, the sidewalk leading to the chapel was gently sloped up to the level of the granite. Although the visual effect of having a slight plinth in front of the building was lost, it was felt to be a less invasive intervention than introducing a new ramp parallel to the sidewalk which would have been more intrusive.

Interior Restoration

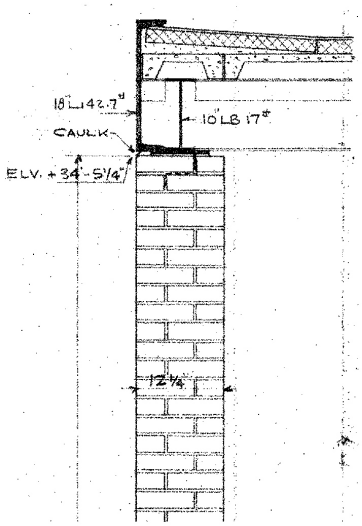
As previously mentioned, funding for this project was difficult and after the exterior was restored there was a hiatus of two years while additional fundraising was pursued. The goal was to bring the interior back to its original condition and update the bathroom to make it accessible for someone in a wheelchair. While basically fully intact, the interior had also suffered from years of poor maintenance and all surfaces were dirty and in some cases deteriorated. In particular, the lower part of the oak veneered plywood paneling that flanked either side of the altar and the doors in the choir room and sacristy areas had been abused by repeated poor cleaning methods that had ruined the bottom of the panels. Additionally all the woodwork located just inside at the west curtain wall had suffered greatly from UV degradation.

The approach to conserving all the woodwork was to retain as much original historic material as possible. All the wood paneling along the flanking walls to either side of the altar was carefully removed and taken off site to a furniture conservation studio. The remaining solid oak framing members that were left in situ were cleaned and refinished in place. The oak veneer plywood had suffered significant damage along the bottom edges due to poor cleaning techniques. In many cases there were losses of veneer (figure 05). For these areas carefully selected new veneer was spliced in with patch called a "Dutchmen"[5]. In the case of the doors at the rear vestibule, the UV degradation was so severe that they were deemed to be beyond restoring at an affordable cost and they had to be replaced. All the solid oak sticking that made up the door frames were also removed, restored in the shop and reinstalled, as were the two cantilevered oak benches.

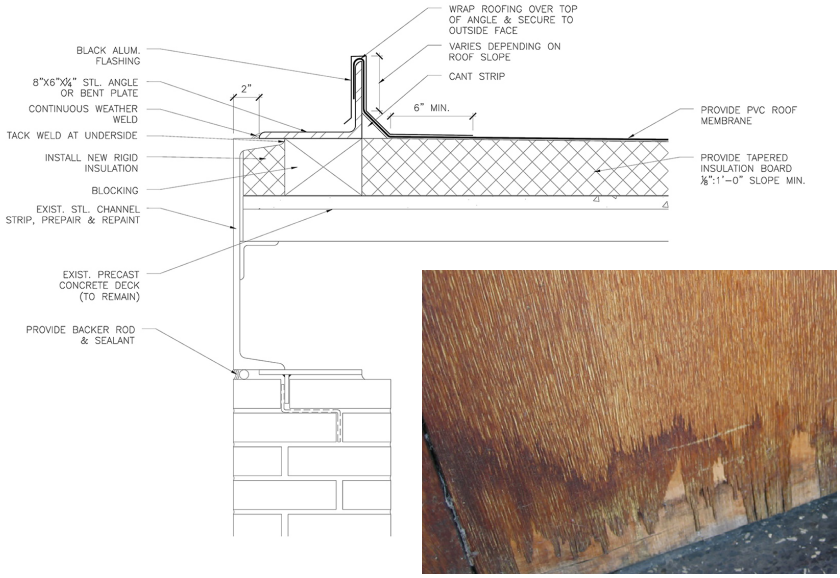
All of the brick masonry walls and concrete roof planks that make up the ceiling were chemically cleaned using mild detergent cleaners. Several of the ceiling panels had been exposed to long term water infiltration and had suffered spalling or cracking due to corrosion of the embedded steel reinforcing. These areas were repaired using a cementitious patching material that was then then inpainted using a compatible masonry coating tinted to match the surrounding concrete.

As mentioned previously, sometime in the 1960s there had been a large box like enclosure created in the loft over the sacristy area to accommodate the pipes for the organ. This was not part of Mies van der Rohe's original design and, in fact, detracted greatly from the lighting effect of the western light washing the yellow brick walls. With advances in technology related to musical instruments and amplification, the pipe organ was no longer needed and had been out of use for some time. As part of phase 2 of the restoration, the pipe organ enclosure was removed allowing the light to once again cascade along walls (essay cover).

Lighting of the walls at night was also an important aspect of the original design (figure 01) The original concept was actually very simple. There were a series of standard inexpensive spot light fixtures mounted in the recess of the beams of the ceiling that would wash the brick walls with light. For the restoration there was a request by the users of the chapel to have more lighting for the people sitting in the space, so several new fixtures were added to each side that allowed for a more even distribution of light throughout the space while still being able to wash the walls. Although it was not possible to get the same original fixtures, a close match was found. There was also a requirement to install emergency lighting which was also located in the recess of the beams so it would not be visible under normal conditions.



03 Mies van der Rohe, Carr Memorial Chapel, Chicago, Illinois, 1952. Historic detail drawing of roof edge.
© Illinois Institute of Technology Archives, 1951.



04 Mies van der Rohe, Carr Memorial Chapel, Chicago, Illinois, 1952. Detail drawing of redesigned roof edge.
© Harboe Architects, 2008.

05 Mies van der Rohe, Carr Memorial Chapel, Chicago, Illinois, 1952. Damage at the bottom of wood veneer panel due to improper cleaning methods and UV degradation.
© Harboe Architects, 2011.

After the completion of phase 2 there was another hiatus in the project while funds were raised to complete the work. The focus for the last phase of the project was to restore the choir and sacristy areas and to create an accessible toilet room.

Phase 3

During the third and final phase of the restoration, an accessible toilet room was created out of the space originally allocated to two small toilet rooms. Many years previously, the toilet was removed from the room to the south when it was converted to a mechanical space associated with the blower for the pipe organ in the loft above. The other toilet had been out of service for many years. To accommodate the larger space needed for access by a person in a wheelchair the CMU partition between the two small toilet rooms was removed thus creating one larger toilet room. This also required the removal of some additional original CMU wall in order to accommodate a larger door wide enough for a wheel chair in a location that had previously been a solid wall.

In the rear vestibule area, the original doors to the two toilet rooms were extremely narrow. At only 21 inches (54 cm) wide, they were not really usable in a practical sense. They were also highly deteriorated due to UV exposure. However it was felt that the door arrangement in the vestibule space was an important design element. Therefore, two new replacement doors were reinstalled in the original frames and fixed in place. This allowed the retention of the design integrity of the rear vestibule space with a more functional accessible toilet room.

A new black terrazzo floor was installed in the toilet room. Although it is a close match to the adjacent original terrazzo of the sacristy, upon close examination it is possible to differentiate old from new.

In order to accommodate much needed additional storage space in the chapel, the two original closets were enlarged by simply moving the closet doors out 2 feet (0.6 m). This resulted in the doubling of the amount of storage space available with virtually no visual impact on the space.

Conclusion

The restoration of Carr Chapel was truly a labor of love for all involved (figure 02). Because it was completed over several phases, it included many different contractors and subcontractors who were all called upon to provide a high level of skilled work at very competitive costs. Although it took over a decade to complete, the results are stunning and the chapel has never been busier with many different student religious groups as well as dancing and music recitals. It is through this continued use that its greatest value has been returned; guaranteeing that the God Box will continue to be enjoyed by IIT students for generations to come.

Notes

1 Fritz Neumeyer, *The Artless Word: Mies van der Rohe on the Building Art*, Cambridge, The MIT Press, 1991, 328.
2 Original Mies van der Rohe drawings located in the Illinois Institute of Technology Archives.
3 "Withe" is a uniquely American term for a skin, leaf or layer of a masonry wall (e.g. a cavity brick wall has 2 withes).
4 Werner Blaser, *Gene Summers Art/Arcbitecture*, Basel, Birkhäuser, 2003, 18.
5 This is a common term used in the USA for a wood or stone patch repair where the same material is spliced in.

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FAIA, Fellow US/ICOMOS, President of Harboe Architects. He received his M. Arch. from MIT, (including study in Copenhagen, Denmark), a MSc in Historic Preservation from Columbia University and an AB in History from Brown University. He also completed the ARC98 course at ICCROM. He has been working in the renovation of works by Mies van der Rohe, Frank Lloyd Wright and Louis Sullivan. He was a founding member of **docomomo** US, and a founding member and current vice president of the ICOMOS ISC20C. He is also an Adjunct Professor at IIT.