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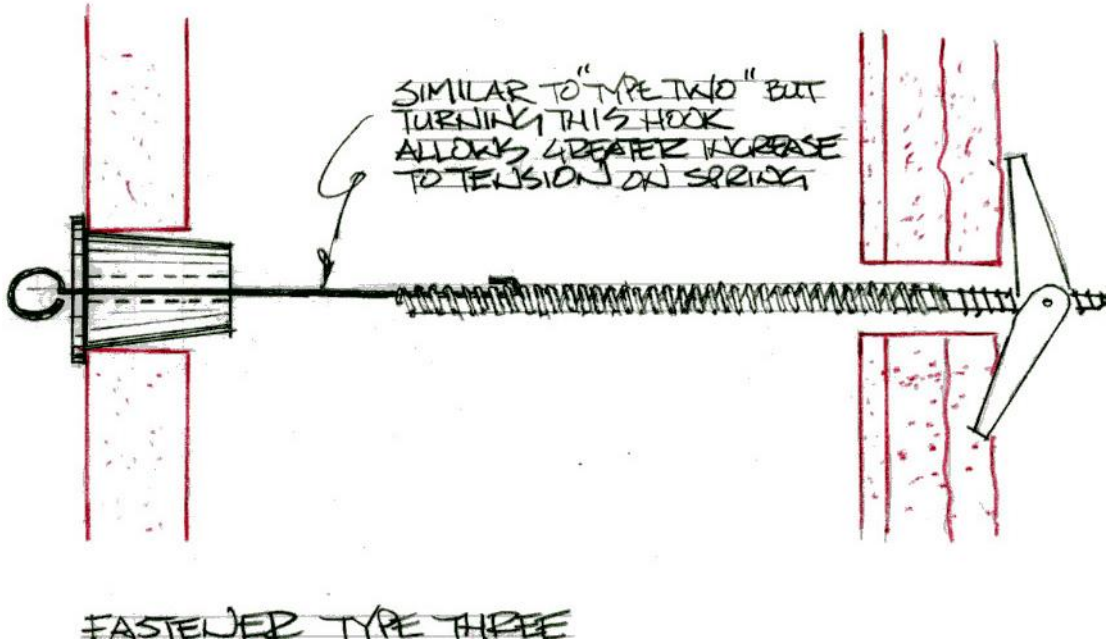
FINAL REPORT
March 14, 2005

The Conservation Of Plaster Ornament
Library Of Parliament, Ottawa

Completed between November 2004 and February 2005
By
Historic Plaster Conservation Services Limited



Acting as a sub-contractor to

Thomas Fuller Construction Co. (1958) Limited

Report complied by Rod Stewart, HPCS

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ECECUTIVE SUMMARY

The project of plaster conservation at the Library of Parliament was driven primarily by concerns for the safety of future building users. The five main components of the work were:

1. An analysis was made of the condition of the last remaining 1870's plain face plaster on the lower walls above the book stacks. Recommendations were made for its conservation and retention.

2. An analysis of the construction and attachment of the network of hollow plaster ribs was made. These were found in general to present no hazard, and recommendations were made and followed for stabilization of loose elements at their intersection points.

3. A study of ornamental details showed that the attached ornament throughout the library was in many instances loose and insecurely connected to its substrate presenting an unknown risk to future users. Conservation of ornamental plaster at the library entailed the securing of all attached decorative plaster to its existing substrate with specially designed mechanical fasteners that would resist damage from a seismic shock. This was not so much a measured scientific approach bringing each and every component up to a new set standard, as it was a decision to significantly improve the fastenings using the described methods wherever it was feasible.

4. Sixteen large plaster corbels located on the upper drum visually support the ribs that crisscross the dome. These required re-connection to their thin plaster substrate, consolidation, and the regularization of expansion joints that had opened up on their upper surfaces.

5. The massive plaster boss at the centre and uppermost point of the library interior was studied. The conservation required included both of the reattaching its outer ornament to its superstructure, and re-attaching of its superstructure to the structure of the building with specially designed fastenings.

PLAIN FACE PLASTER

After a fire in the 1950's, most but not all of the interior plaster in the library was replaced because it was deemed important to remove its combustible wood lath backing in the fire proofing renovation that followed. The only original plaster to survive has been applied directly to the masonry walls near the top of the lower drum. This plaster was retained, but in the current project questions were raised about its integrity. To resolve the issue, the plaster was sounded thoroughly using a 2 kg. hard rubber mallet. The sounding resulted in the identification of large areas of wall surface that seemed to be poorly attached or that sent back a hollow sound on contact with the mallet. The entire surface was mapped in an effort to identify categories of weakness or strength.

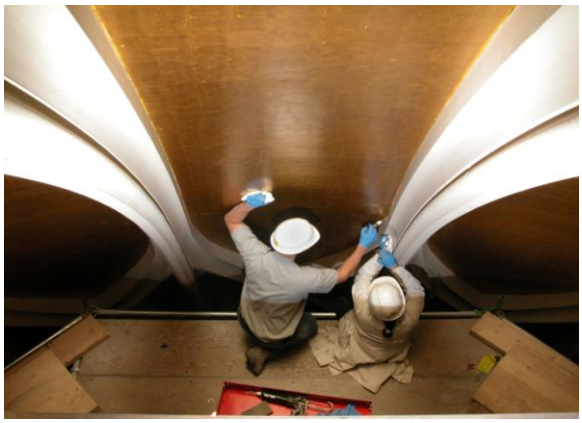
On an experimental basis some areas that sounded particularly loose or delaminated, were treated with an injection of acrylic resin consolidant in an attempt to strengthen what presented on sounding as a poor connection of the base coats of plaster with its masonry substrate. This exercise proved fruitless and no improvement was measured.

Because sounding is at best a subjective testing method, and because our experiments had failed to make any discernable improvement in the sound of the plaster, the decision was taken to execute some destructive tests on a few areas of the plaster that sounded worse than others. Plaster was removed from four representative small areas so that the sounding could be done on the brick substrate. When this was done, it was observed that indeed the loose sound was emanating from deep within the wall itself and had nothing whatever to do with the strength or security of the plaster.

The result of this part of the conservation project was to reduce the intervention on this important original plaster to simple cosmetic repairs to areas of local damage using very conventional commercially available even pre-mixed repair materials familiar to the plastering and drywall trades working today.

PLASTER RIBS

The hollow cast plaster ribs that rise from the corbels at the base of the drum were inspected carefully and found to be in substantially good condition. The method of construction was thin walled reinforced casting in two sided molds. The finished ribs had been raised into location and tied in place with malleable fence wire. Finish plastering of the wall behind them provided a lock so that the ribs did not move. Ribs running counter clockwise (imagining the building in plan) were installed first and in longer sections. Then ribs running clockwise were put in place in shorter pieces. The intersections between crossing ribs was an area requiring conservation.

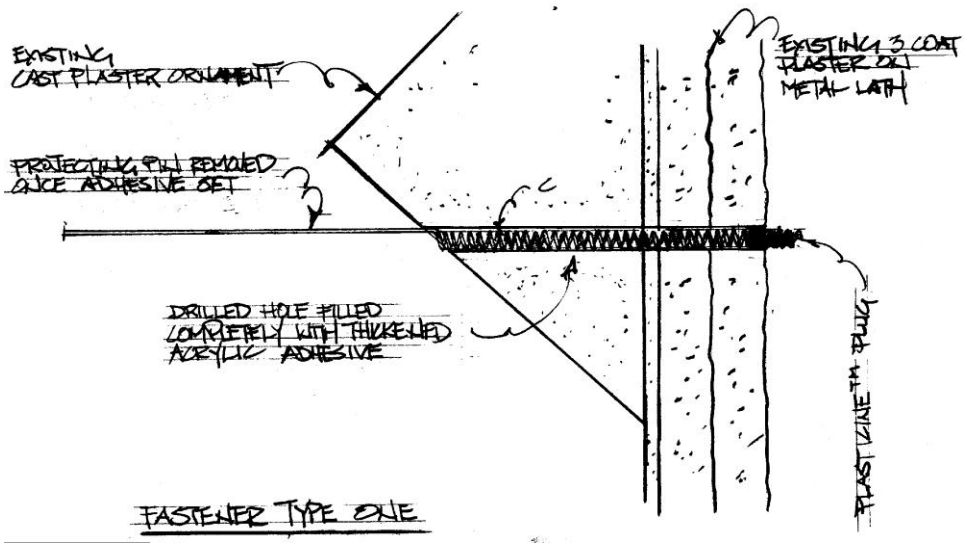


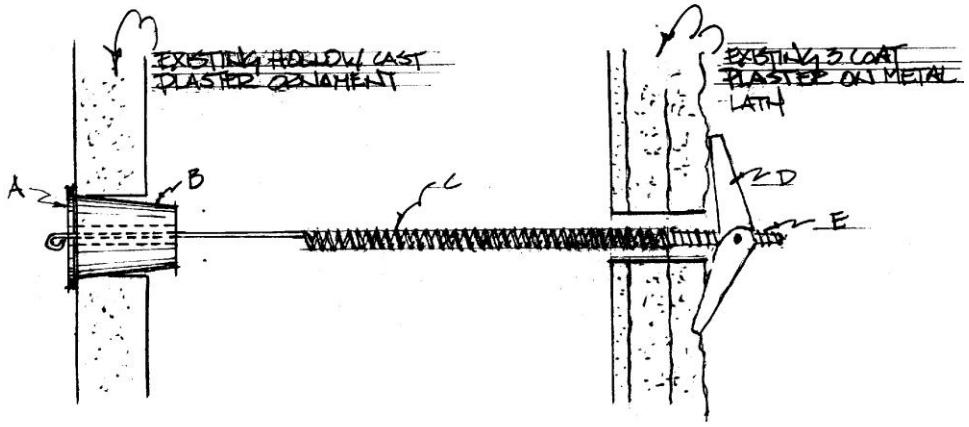
Fine holes were drilled at about ¾” apart along any cracks found. The cracks were rinsed out thoroughly with a pre-wetting solution of methyl hydrate, and then reinjected with a thickened HPCS adhesive. Many thousands of holes were drilled and injected across the entire rib system.

ATTACHED ORNAMENT
Window Heads
Spherical Leaves
Cylindrical Column Bases
Lamp Bases
Short Columns
Lancet Window Dog's Tooth Ornaments
Lancet Window Bosses
Gilded Cornice at Observation Level
Corbels at Base of Dome

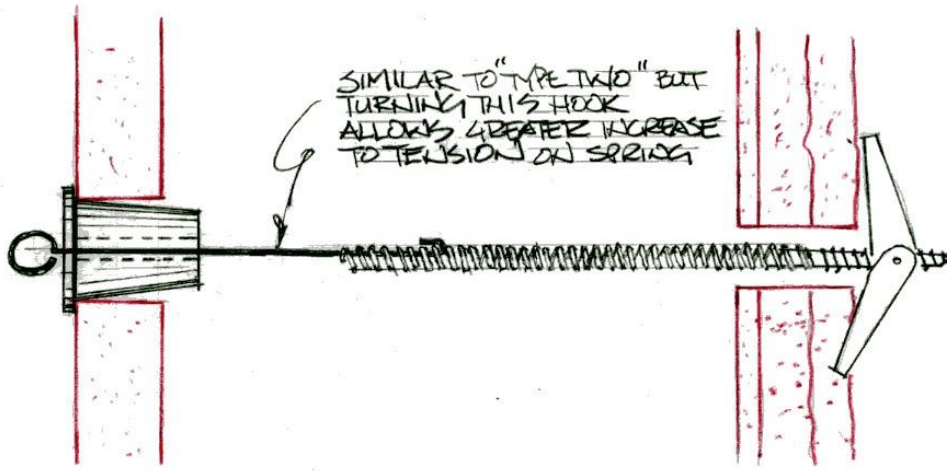
Custom Designed Fasteners

A major focus of the LOP project involved seismic upgrading of the building. In accordance with this requirement, a major focus of the plaster conservation was seismic upgrading. A set of five similar but slightly different fasteners was designed to meet the specific needs of each plaster element to be re-fastened.

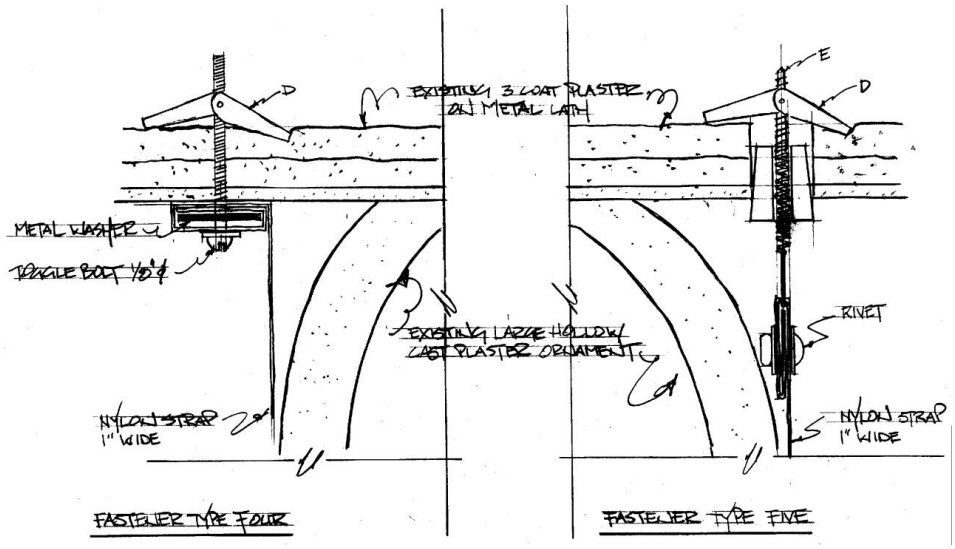




FASTENER TYPE TWO



FASTENER TYPE THREE



NOTES:

-A- COPPER PENNY SHIM 3/4" ϕ x 1/16" TH. WITH HOLE 1/32" ϕ.

-B- #4 TEST TUBE CORK

-C- "HPCS HELIX PIN™" #304 STAINLESS STEEL WIRE 1/32" ϕ

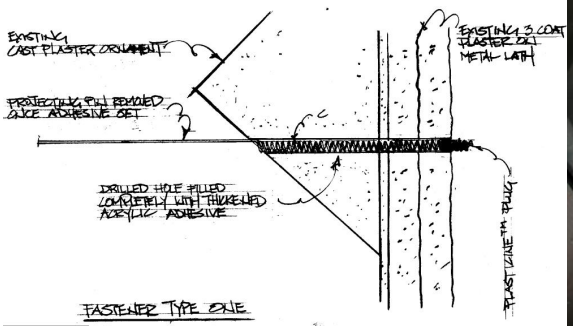
-D- TOGGLE - STAINLESS STEEL

-E- WOOD SCREW SHANK, #6 STAINLESS STEEL

Other Technical information on Fasteners
Springs are made from .032 Stainless Type 302 ,ASTM A313 (tensile strength 282 -310 ksi (1945 – 2135 MPa)
Spring body has 35 coils per 3” of length
Linear Pitch is .083”
Angular Pitch is 11.7º
A spring with a screw insert (aprox. 30 coils active) will withstand force of 8 – 9 lbs. before taking a set. The term set in spring parlance is the point where a spring does not return to its original length.

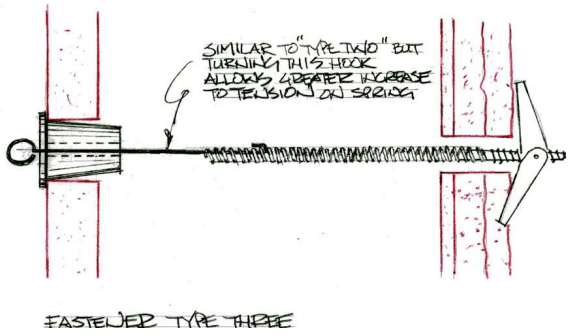
Window Heads

The 16 principal windows standing above the library drum are each headed with one of four different plaster ornaments that consist of several different components. The conservation consisted of insertion of HPCS Helix Pins™ The location and number of pins varied as required by the particular conditions. Typically each window head required the insertion of between 8 and 12 individual pins. Pins were installed according to the method described on the HPCS Plaster Condition Survey (see appendix). In total, 180 pins were installed to secure these elements.



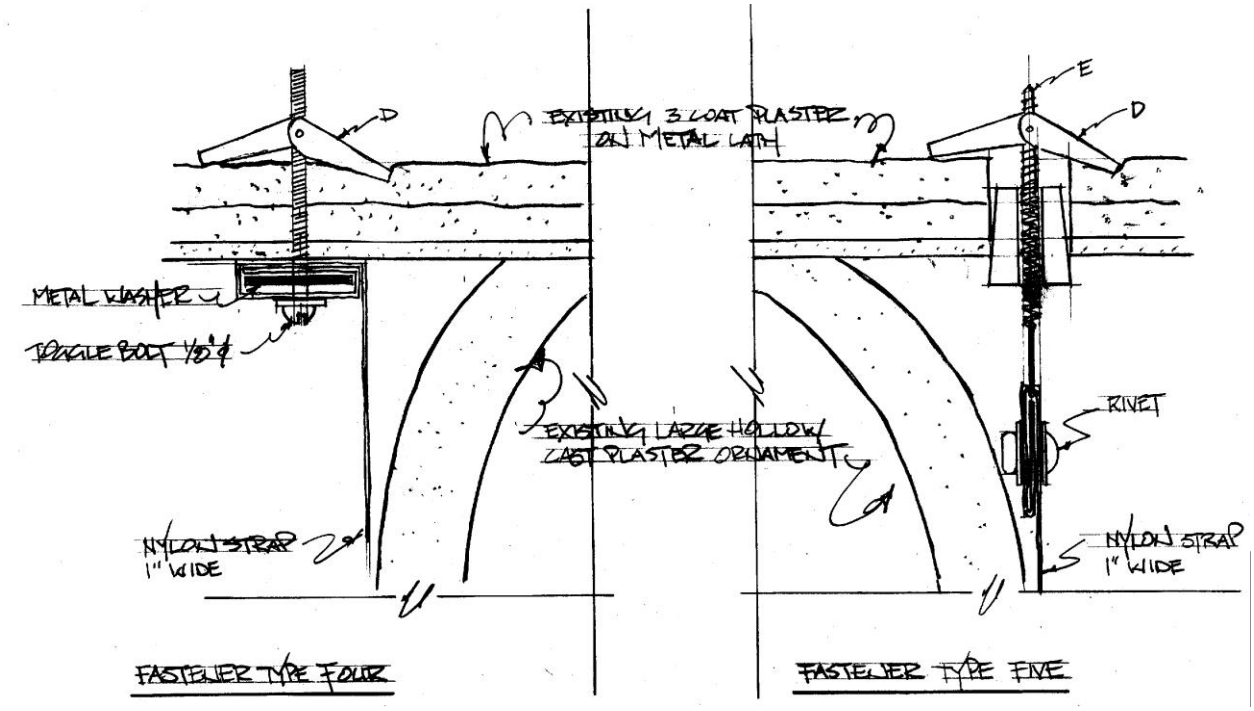
Spherical Leaves

64 gilded Spherical Leaves ring the upper library in a groove just above the terminating ring of the ribs. These elements were originally are attached with the simple method of slathering a blob of plaster of Paris on the back of the element and holding it in place until the plaster set. The original survey indicated that several of these pieces had become detached.



Cylindrical Column Bases

The 16 column bases are a thin walled casting mounted with a simple blob of plaster of Paris. A single point of contact would be very likely to break under any significant stress. The polypropylene strap spreads our contact over about 24 square inches and makes contact at a fairly robust part of the element. Fastener types 4 and 5 are used in tandem, one at each end of the 1” poly strap.



Lamp Bases

The 16 truncated octagonal lamp bases required connections. This called for a single pin inserted through a substantial section of the element connecting it through the substrate plaster.

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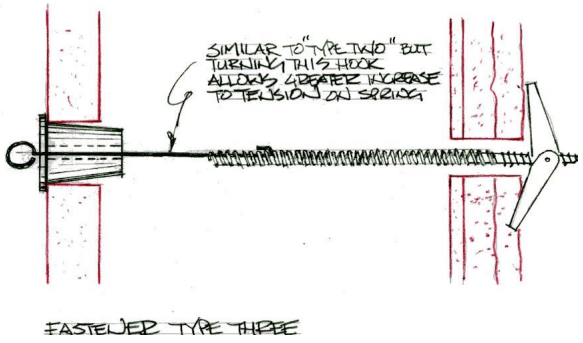
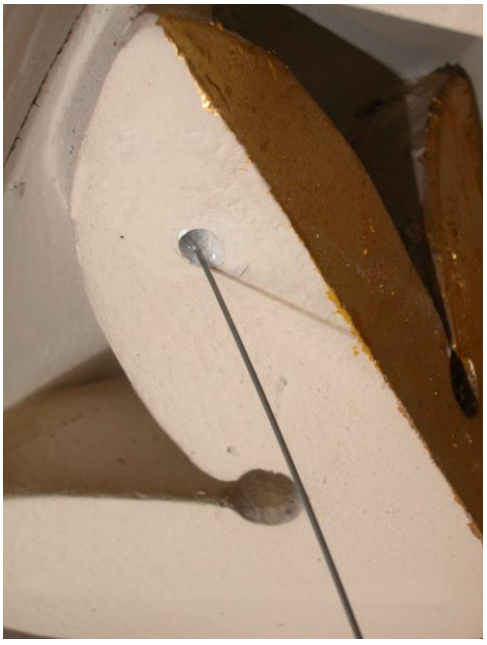
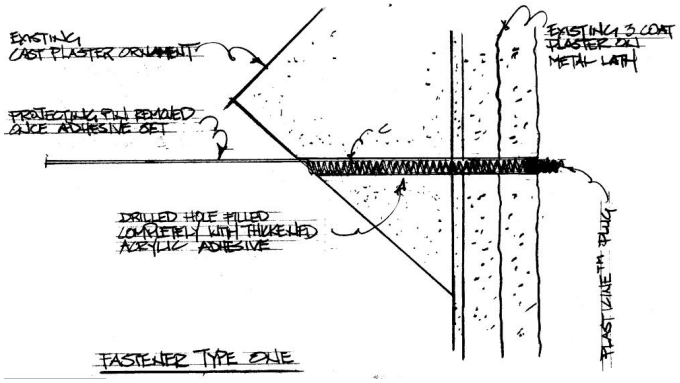


Lancet Window Dogs Tooth Ornaments

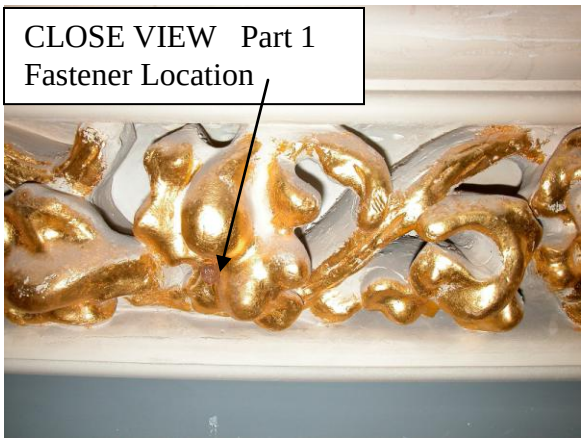
There are 640 dogs tooth ornaments surrounding the 16 lancet windows. As the images illustrate, original attachment was with simple plaster of Paris. The conservation treatment consisted of application of two simple spring pins into each of the dogs tooth ornaments.

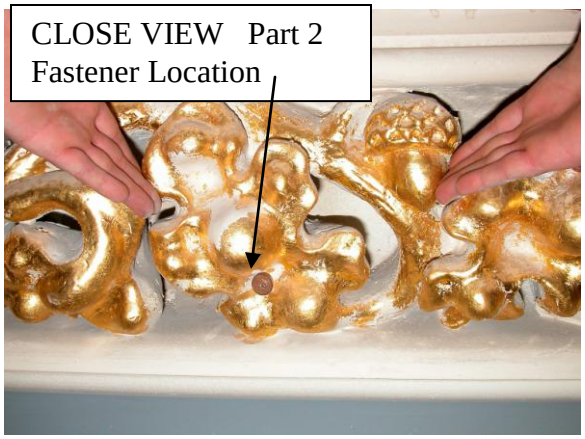


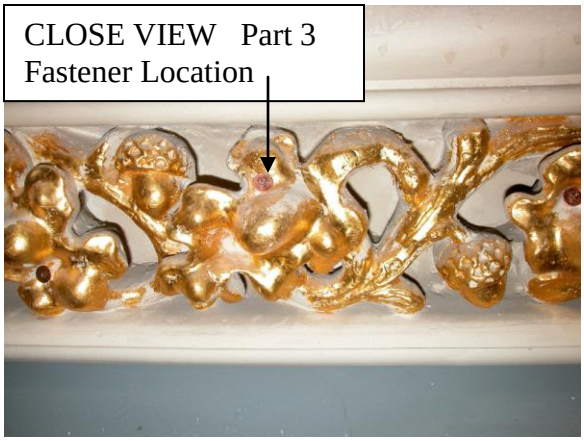


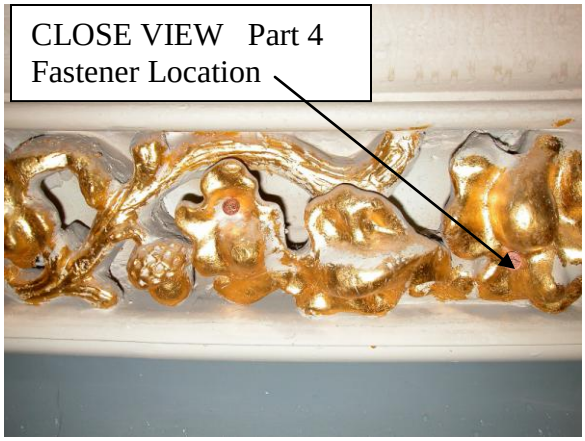
Gilded Cornice at Observation Level

The gilded cornice at the base of the dome consists of 22 distinct pieces each approximately 48” long, and connected in place by simple plaster of Paris. Each piece of the cornice required 4 distinct attachments using Fastener Type Three.









Eighty eight fasteners were used to stabilize the gilded cornice.

CONTROL JOINTS ON CORBELS AT BASE OF DOME

The 16 large corbels that appear to support the arches that decorate the upper dome are thin walled cast plaster fastened to the wire lath and plaster substrate plaster wall with a few randomly spaced wire connections and some plaster of Paris. The tops of these corbels are comparatively heavy. Over time, it has been observed that an unplanned expansion joint has formed around the tops of these corbels, possible in response to slight movement of the surface of the dome above. It was decided that the corbels should be stabilized and then that a forced expansion joint should be created to allow such movement as might occur to take place without damage to the ornament.

The corbels were filled, with a low density (2 lb./per cu. ft.) polyurethane foam poured through ¾" holes drilled through their tops. This adhered to the entire interior surface and distributed the weight of the element evenly across the plaster substrate wall surface.

The heavy corbel tops were anchored to the substrate wall with straps of polypropylene connected with Fastener Type 4.

Large Boss at Dome Top

The large central boss is connected to the structure by a series of connecting wires and metal bars. None of these connections is well understood, and their quality and integrity could not be verified. In addition, the boss itself was found to have interior weaknesses typical of this kind of fabricated element.

The boss was pinned at over 150 locations across its surface. The intention was to ensure the connection of the boss surface treatment to the interior sphere. Fastener Type 1 was found to be effective for this treatment.




Elements that broke off the surface of the boss during the examination were re-connected using Fastener Type 1 and HPCS acrylic resin.