



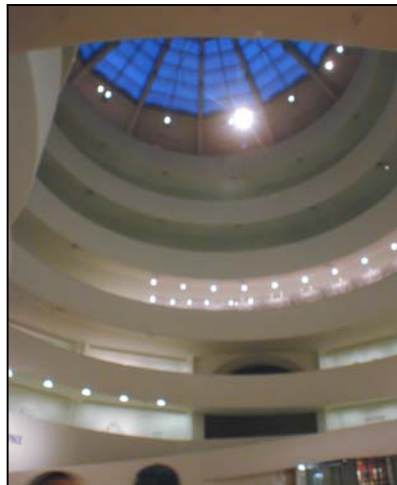
**BUILDING
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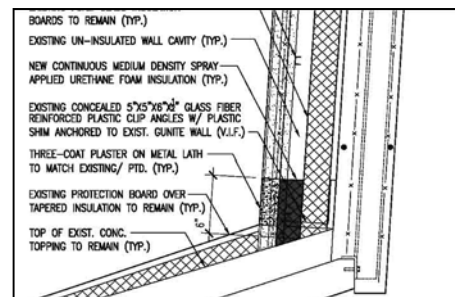
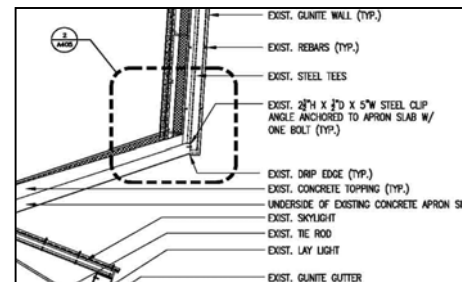
BES participates in the restoration of the Solomon R. Guggenheim Museum

Structural renovations of the building included insulating thermal short circuits that were causing moisture problems in the gallery spaces.

Building Envelope Solutions' involvement in The Solomon R. Guggenheim Museum project began with a referral from Bill Rose who was a member of the design team.



The problem that was to be addressed was a gap in the insulation at the intersection of the exterior wall and the sloped floor that occurred around the perimeter of the ramped gallery space. Relatively high humidity levels in the conditioned indoor space caused condensation on the interior surfaces at these locations.





The original plan was to demolish the lower portion of the walls in the areas where the insulation was missing, install insulation, and repair the interior finishes. This plan included an extended period where closing the main section of the museum would be required. The photo to the left shows a small test area where the plaster was removed, as in the original plan, to confirm the effectiveness of the approach.

BES developed an approach that avoided the need for demolition and replaced the open spray application of closed-cell foam insulation with an injection process which filled the voids in the existing insulation with closed-cell polyurethane foam through small holes in the interior plaster finish.

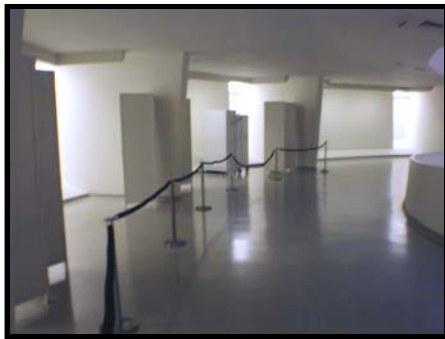
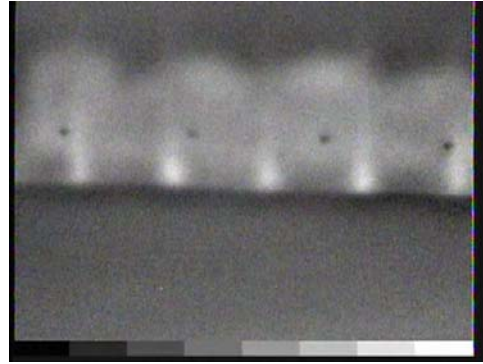


Specialized portable injection equipment was developed for this remote application.

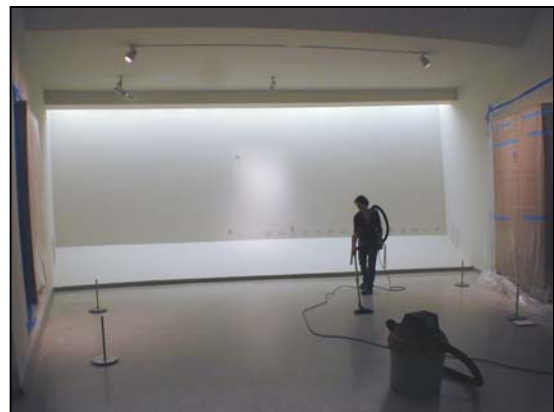




This process was monitored by infrared thermography done while the exothermic heat of the chemical reaction was present. This verified that the void was filled to the required level with the new insulation. This quality assurance procedure was video recorded as the work progressed.



The work was organized in sections. Each night after normal museum operating hours, holes were drilled, the cavity injected with foam, and the holes patched and painted. Work progressed in this way until all the sections were completed. Closing the museum to the public was never required.



It was estimated that the less invasive process saved the Guggenheim over \$100,000 in demolition, repairs, and lost revenues.