EngbergAnderson Design Partnership, Inc.

Transmittal

Date	April 12, 2002
To	**Brian J. Pionke**
	City of Milwaukee Department of City Development
	809 North Broadway
	Milwaukee, WI 53202
Fax No.	**Phone No.**
Project No.	021191
Project Name	Milwaukee City Hall Historic Restoration
	Exploration and Remedial Stabilization Study
Sent Via	☒ Mail ☐ Courier ☐ Fax **No. of pages including this page**

Copies	Dated	Description
1	3/18/02	Peer Review Report

From Danielk Kabara AIA, NCARB

Copied

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EngbergAnderson Design Partnership, Inc.

March 18, 2002

Mr. Venu J. Gupta
Director
Department of Public Works - Buildings & Fleet Division
Room 602, Zeidler Municipal Building
841 North Broadway
Milwaukee, Wisconsin 53202-3613

Re Peer Review of the Wiss Janney Elstner Phase II Report
Milwaukee City Hall Exploration and Remedial Stabilization Project
Engberg Anderson Project No. 021191

Dear Mr. Gupta,

Engberg Anderson Design Partnership is pleased to submit this Peer Review Report to the City of Milwaukee. The report describes the process and findings of the peer review coordinated by Engberg Anderson Design Partnership for Phase II of the City Hall project.

The peer review process brought historic preservation experts and technical experts together from across the country for three days of intensive discussion relating to the Exploration and Remedial Stabilization Project undertaken by Wiss Janney Elstner (WJE) for the City of Milwaukee. A panel of nationally known professionals in the field of building restoration were invited to present their questions, observations and critique to WJE and representatives of the City Department of Public Works, staff to the City's Historic Preservation Commission, and the Preservation Architect from Wisconsin Historical Society. Our collective purpose was to find consensus on all major issues and recommendations that are examined in great detail within the WJE Phase II report including issues of cause and effect, remedial technologies, implementation schedule, and overall phased project cost.

The review panel found consensus with WJE's general findings and most of the particular remedial actions recommended and confirmed the report's cost estimates. Chief among these confirmed findings was that Milwaukee's City Hall is among a very select group of buildings that will qualify for National Historic Landmark status and that a major public building of this importance should be carefully restored to the fullest extent possible to preserve, for generations to come, this unique example of civic architecture.

We are honored to have been selected to help organize and preside over this Peer Review process. Please feel free to contact me with any questions regarding the contents of this report.

Sincerely,

Charles M. Engberg, AIA, NCARB

Partner

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MILWAUKEE CITY HALL HISTORIC RESTORATION EXPLORATION AND REMEDIAL STABILIZATION STUDY PEER REVIEW REPORT

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PART I INTRODUCTION

Summary

Constructed during the years 1893 through 1896, the Milwaukee City Hall building is an important civic landmark as well as a significant historic building. The exterior envelope of the building is currently in need of major repair and restoration work. This report is the culmination of an independent review of the findings of an Exploration and Remedial Stabilization Project on this building undertaken by Wiss, Janney, Elstner Accociates, Inc. (WJE) for the City of Milwaukee.

The Exploration and Remedial Stabilization Project is Phase 2 in a 4-phase project designed to identify and correct deterioration evident in the roofing and building enclosure of Milwaukee City Hall. The intent of the City in commissioning this independent review is to augment the credibility of the process and findings described in the WJE report in several ways: The review was intended to verify the magnitude and nature of general and particular findings regarding materials and methods of construction. The review also serves to verify cost conclusions contained within the WJE report.

Individuals expert in particular areas of historic building construction or restoration with extensive knowledge to understand and critique the WJE findings performed the independent peer review of the WJE report. The Peer Review Group discussed the WJE report at length and provided comments where necessary that enhanced the report. The Peer Review Group also concluded that based on the significant nature of the building and its current condition, a budget of approximately $43 million over a period of four years is appropriate for the extent of work that is necessary for the repair and restoration of the building.

Methodology

Engberg Anderson Design Partnership worked in conjunction with the City Advisory Team from the Department of Public Works to develop a list of candidates for the Peer Review Group. The credentials of all potential participants were reviewed and the most qualified individuals were selected to be a part of the Peer Review Group. The final Peer Review Group included historic preservation architects and engineers, material preservation experts, material fabricators, construction experts and construction cost estimators. Each individual was selected, in part, based on his or her extensive experience in similar historic restoration projects.

Prior to the peer review meetings, the WJE report was distributed and reviewed by each peer. Questions and comments regarding the contents of the report were collected by EADP from each individual and were provided to WJE for review prior to and for response during the review meetings.

Engberg Anderson Design Partnership coordinated, moderated and recorded the findings of the peer review. The review took place over the course of three days from February 27, 2002 to March 1, 2002. As a reference for discussion, each critical area of the building was observed during a building tour or through photographs presented during the sessions. The sessions mirrored the format of the report and included:

- An overview of the project
- A building description and tour
- A discussion of the building's history
- Several material assessment discussion sessions focused on each section of the report.
- A discussion about the approach and philosophy that will serve as the foundation for recommendations for the treatment of the building
- A review of repair approaches and constructability
- A cost estimate review

The Peer Review Group, WJE and several observers attended the review sessions from the City Advisory Team, the staff to the City of Milwaukee Historic Preservation Commission and a representative from The Wisconsin Historical Society. These sessions typically included a Power Point presentation of existing condition photographs, presentation of recommendations contained within the WJE report and extended periods of discussion. Questions and comments were accepted from both the Peer Review Group as well as the observers throughout each day's meetings.

Typically, questions posed by the peers and observers were discussed until consensus was developed. Consensus consisted of either agreement with the WJE findings or the recommendation of modifications to the WJE report. In some instances, it was determined that several different approaches to repair and restoration work were valid. In these instances, the group concluded that the selection of a specific approach would most properly be done by the design professional that ultimately prepares construction documents for the work. The budget contained in the WJE report was adjusted to accommodate the most expensive of the different potential solutions.

Peer Review Session Attendees

The Peer Review Group consisted of the following individuals:

John G. Waite, FAIA	John G. Waite Associates, Architects, Albany, NY
Brent Gabby, P.E.	Simpson Gumpertz & Heger Inc., Arlington, MA
Elizabeth Corbin Murphy, AIA	Chambers, Murphy & Burge Restoration Architects, Akron, OH
Simon Dvoretsky	Construction Resources Management, Long Grove, IL
John Speweik	US Heritage Group, Chicago, IL
John Krouse, C.E.	Boston Valley Terra Cotta, Orchard Park, NY
Joel Becker, P.E.	Hunzinger Construction Co., Inc.

The Wiss Janney Elstner Team consisted of the following individuals:

Michael Scheffler, P.E.	Wiss, Janney, Elstner Associates, Inc.
Michael Ward, Project Architect	Wiss, Janney, Elstner Associates, Inc.
Ken Itle, Project Architect	Wiss, Janney, Elstner Associates, Inc.
Harry Hunderman, FAIA	Wiss, Janney, Elstner Associates, Inc. (3/1/02 only)
Jim Schumacher	J. P. Cullen and Sons, Inc. (3/1/02 only)

Observers included the following individuals:

Greg Kizevic, Architect	City of Milwaukee Department of Public Works
Gary Kulwicki, P.E.	City of Milwaukee Department of Public Works
Bernard Mielcarek, Architect	City of Milwaukee Department of Public Works
Ronald Schoeneck, Architect	City of Milwaukee Department of Public Works
Brian Pionke, Preservation Officer	City of Milwaukee Department of Historic Preservation
Brian McCormick, Preservation Architect	Wisconsin Historical Society
John Hunzinger, P.E.	Hunzinger Construction Co., Inc. (2/28/02 and 3/1/02)
Tim Jordan	J P Cullen and Sons, Inc. (3/1/02 only)

The Engberg Anderson Design Partnership Team consisted of the following individuals:

Charles Engberg, AIA	Moderator
Joseph Huberty, AIA	Scribe
Kevin Donahue	Scribe
Daniel Kabara, AIA, NCARB	Scribe

PART II PEER REVIEW MEETING NOTES

The following notes are intended to be neither an exhaustive record of the peer review meetings nor a summary of the WJE report. The information contained herein reflects the discussions, conclusions and agreements reached during the course of these meetings. Where appropriate, recommendations are made for modifications to the WJE report.

Notations that appear in the text refer to the composite list of peer questions and comments contained in Part III of this report.

APPROACH AND PHILOSOPHY

The ongoing discussion of the basic approach and overall philosophy for the exterior restoration of the Milwaukee City Hall, which is on the National Register for Historic Places, is necessary in order to establish a framework within which restoration and preservation goals can be framed and decisions developed for each aspect of the restoration process. Concepts that evolved from this discussion, including the appropriate restoration period and general preservation policy, were used to guide each material assessment discussion towards consensus.

Although City Hall has symbolized the city of Milwaukee and has been a source of local pride for over a century, its significance extends beyond the city and region. This is not only due to the high quality of its proportion and detail but also because it embodies a significant transitional period in its innovative building technology, which was advanced for the 1890s. For these reasons, the Peer Review Group strongly recommended that the City pursue National Historic Landmark status for the building. As one of the premier governmental buildings constructed during the latter part of the nineteenth century, the Milwaukee City Hall has national significance. If the building is deemed a National Historic Landmark, its importance will be reinforced in the minds of local citizens and the building will garner increased attention from outside the city. As a result, funding from outside the City of Milwaukee may be available to aid in its restoration.

The Peer Review Group felt that, as soon as possible, the City should commence the process of generating an Historic Structure Report that documents the total building history of the City Hall. The report should identify and describe the buildings significant architectural and building construction features and prescribe a long-term plan for their conservation and/or modification when required. This will help future decisions, such as the establishment the most significant period of the building's history, to aid in the selection of historic details that are to be recreated and installed on the building. The report will also help guide the stabilization of the structure to ensure the long-term survival of the building. It will also be required in order to apply for certain public and private foundation grants.

The Peer Review Group revised list of the goals stated in the WJE report for the restoration project to read as follows:

1. Build public support for the project.
2. Generate an historic Structure Report.
3. Develop a Preservation Plan that will ensure the long-term survival of City Hall in a form that recognizes and maintains its historical, architectural and civic significance.
4. Develop a broader implementation plan and budget that includes both the current restoration and preservation work as well as future cyclical maintenance and preservation programs.
5. Attain National Historic Landmark Status.
6. Create a safe building.
7. Establish maintainability.

The Peer Review Group agreed that all four historic restoration interventions as defined by the National Parks Service will be required to some extent: Preservation, Rehabilitation, Restoration and Reconstruction. The historic Structure Report will guide this work, as well as future work, so that the most appropriate elements can be preserved or replaced and the less appropriate previous interventions can be revised.

The Peer Review Group agreed that the building need not be brought back to the exact condition of a particular date. Instead, the City should allow the building and its history be a guide to the most appropriate restoration using collective best practical judgement in the selection of detail and material restoration.

BRICK

The condition of brick materials on the building was reviewed including:

- Mortar Joints
  - Deterioration / Erosion
  - Wrong color of previous pointing work
  - Backup mortar
- Surface Deterioration
- Cracks and Displacement Related to Thermal / Moisture Expansion
- Water Related Distress
- Cracks and Displacement Due to Insufficient Structural Bracing
- Cracks and Displacement Due to Corrosion
- Cracks and Displacement Due to Previous Repairs

Recommendations were presented from the WJE report. Subsequent discussions resulted in the following findings:

The Peer Review Group felt that it is not desirable to replace original materials that are still in serviceable condition; if the majority of bricks in a particular area are in need of replacement, it may be most practical and cost effective to replace all of the brick in that specific area. Existing brick that is removed but is in good shape should be cleaned and used as replacement infill for small areas of wall surfaces where the majority of existing brick that are to remain intact.

It is difficult at this time to define in the preliminary budget an exact percentage of brick that must be replace in each area. Regions are defined where complete replacement is necessary and other areas requiring partial brick replacement must be reviewed on an individual basis during the construction documents phase.

Written questions and comments were then addressed:

Current Wall Condition
It was found that the building's bricks match those specified in the original construction documents. [23] In several areas of the South Tower where the wall is "out of plumb", it is unknown at this time (and might be difficult to determine) whether these portions of the original construction were plumb immediately after the original construction was completed. [24, 28]

It was felt by WJE that both moisture infiltration and previous high-pressure cleaning work caused the deterioration of brick surfaces. Pollution was not thought by WJE to be a cause, as excessive deleterious material was not found on the brick, therefore Energy-Dispersive X-Ray analysis was not performed. Some spots are thought to be gypsum deposits on the brick surface as a result of coal pollution. Other spots are likely to be oxidation of materials within the brick that were exposed to the elements by aggressive washing. Other discoloration may be exposed inner grog of the brick or may an expression of chemical salts within the grog or may be other types of staining or dirt. These areas of discoloration have, in recent years, increased in area gradually. [25, 29, 30, 40]

Moisture infiltration was monitored visually; instruments were not used to measure the depth of infiltration at various depths in the wall. [12, 26] The original bedding mortar seems to be intact in most areas of the building. There have been several tuck pointings over the life of the building to date.

The combined environmental forces of wind, water and thermal expansion and contraction acting on the building, and especially the clock tower, were discussed at length. It was ultimately recommended by the Peer Review Group that a structural analysis in conjunction with follow-up monitoring of the structure over the course of one year will provide the most accurate data to assist in the structural remediation to be included in the Construction Documentation phase of the project. [22, 27, 31, 32, 37]

Statements regarding "average expansiveness percent" will be elaborated in the WJE report. [46]

Reconstruction of Brick Walls
Complete reconstruction is limited to areas of severe deterioration where there is no other option. [35] To avoid mortar adhesion problems, salvaged brick will be used only in limited areas where it is necessary to match original brick construction. [44] Concern was raised over the approach recommended for leaving some of the vertical "movement" cracks within the walls to accommodate future movement. It was felt that because so much care is being taken to restore damaged areas that it would be inappropriate and unsightly to simply fill some vertical cracks with sealant. The Peer Review Group thought that cracks occurring as a result of thermal movement should be identified and that a more defined approach should be taken to address and treat specific areas in the masonry to accommodate future movement. [38, 39, 41, 42, 45]

Joint Preparation
Photos were presented of pointing test areas. Horizontal joints are to be cut with 1/8" thick blades. The remaining horizontal joint mortar, as well as that of the vertical joints must be cleaned with hand tools to protect the brick and maintain the original joint size. As recommended in the WJE report, removal of old mortar should extend to the depth of sound mortar with a minimum depth of ¾". It is recommended that only masons certified by an organization such as U.S. Heritage should only perform the work and that careful on site observation is performed. [2, 5, 8, 11]

Mortar Mix
Compression test methods and results for historic mortar (including that of previous pointing work) and brick are contained within the report. [1, 3, 4] The group agreed that new mortar materials should be pre-blended prior to delivery in order to avoid the inconsistencies common to the practice of mixing of ingredients on site. The Peer Review Group also agreed that the mortar that is ultimately specified for pointing on the project must not exceed the compressive strength of the brick thus making the mortar joints the "sacrificial" component in the wall assembly. Deviation from this could result in further distress cracking in the future. The Type N mortar that is specified in the WJE report may be too high in compressive strength, commonly reaching a compressive strength in excess of 3,000 psi. While the WJE report concluded that most of the brick distress is the result of water infiltration, it is recommended that testing be performed to determine the various mortar mixes that were used as well as the strength of the original mortar. New mortar may be specified by mix ratio (with ratio matching the original specifications) or as a higher range Type O mortar to provide a balance between strength and durability. It is estimated that Type O mortar will result in lower strengths ranging from 750 to 1,000 psi depending on the absorption rate of the surrounding brick (as well as other masonry) materials. It was stated that Type O mortar should not be avoided because of its lower strength and that, in fact, there are walls constructed with low strength mortar that have stood for 100's of years with mortar intact. The architect of record should only make this determination after further analysis is performed. [7, 13, 14, 15, 16, 17, 18, 19, 20]

It was generally agreed that the mortar should be tinted to match the color of the brick if it is determined that this was the case originally. This will both avoid joints that appear too "new" and will also match the intent of the original specifications.

Pointing

As recommended in the WJE report, face grouting must not be allowed. Joints should be pointed in three lifts as recommended to provide tight joints with as much longevity as possible. Although it is advised that research should be done to determine if the original specifications, which called for struck joints, were followed, the reviewers also felt that struck joints, not tooled, are most appropriate. This will conform to the original written specifications and also avoid the problem of joints that are tooled to a point of strength that does not allow water within the wall to escape. Concern was raised that if all of the joints are pointed there will be no original basis against which to judge newly pointed joints and that the building will lose some of its historic appearance and take on a "new" look. An alternate viewpoint was expressed that partial pointing could result in a non-uniform appearance on the building's facades. It was reported that virtually none of the mortar on the building faces is certifiably original. It was ultimately determined that 100% pointing is appropriate. This is due in part to the expense related to scaffolding the building and the desire to get the building on a regular schedule of maintenance; leaving some joints untouched may result in further required joint repair in the near future. [6, 9, 10, 16]

Metal Elements Within Brick Masonry Construction

Structural steel materials will be cleaned and painted where possible and replaced only as necessary with like material. [33] Type 304 stainless steel ties will be introduced through mortar joints only where necessary to retain composite wall construction in areas where extensive brick is replaced. [34, 36, 43]

Note: Question 21 was deferred until the Terra Cotta discussion.

TERRA COTTA

The condition of terra cotta materials on the building was reviewed including:

- Cracks and Displacement Related to Corrosion of Embedded Steel
- Cracks Related to Masonry Confinement or Concentrated Loading
- Cracks and Displacement Related to Thermal Movement and Expansion
- Distress Related to Expansion of Brick Backup
- Distress Related to Water Infiltration.
- Original Design Detail or Inappropriate Repair
- Missing Architectural Elements

Recommendations were then presented from the WJE report and written questions were addressed.

Horizontal or "Skyward" Joints
There was extensive discussion regarding what is the most appropriate treatment for upward facing flat and roll cover joints in sill and coping elements throughout the building. Most felt that the use of sealant alone is inappropriate from an historic preservation and longevity standpoint and that it will collect dirt quickly. It was suggested that mortar, as in the original construction, should be used. The use of mortar will eventually allow water infiltration into the wall construction and would only be appropriate if flashing (and possibly weeps) were installed under the terra cotta elements. Some reviewers felt that it is inevitable that water enter the wall system and that flashing is the only way to get it back out. Others felt that flashing installed over the top of units, as discussed later, would adequately prevent water from entering. [33] This is possible in limited locations where walls are being dismantled but would require unnecessary intervention in walls that are otherwise sound. The introduction of mortar that has high compressive strength could also cause future compression damage to terra cotta elements. *

An alternate solution of lead "T's" was proposed for flat joints. Several peers approved of this because of its longevity and more historic nature. It will be included as an option in the WJE report. It was also suggested that a sample should be installed so that the visual appearance of this solution can be ascertained. [37]

An additional alternate solution is for cast lead flashing and drip to be installed over the top of select terra cotta elements in discreet locations. Some peers favored this material over copper and lead-coated copper because of its malleability and longevity. Also, lead is not as likely to affect the appearance of the building from street level or cause streaking on lower wall surfaces. Although this introduces an element that was not part of the original construction, some reviewers felt that it would be acceptable as it corrects a defect within the original detailing.

Roll-Cover Joints
The treatment of roll-cover joints was discussed at length. Some reviewers favored an approach that kept water out of the assemblies below. These include the installation of preformed sealant over the joints or the placement of formed lead flashing over the top of these assemblies. Other reviewers felt that flashing should be installed under the units to mitigate water infiltration. This solution was thought to be more invasive as it requires the disassembly and replacement of the entire coping. Another proposed solution was that roll-cover joints that are broken should be repaired to match their original construction as closely as possible. This could be accomplished through the removal of broken portions and the installation of dutchman repair units. The WJE report will be modified to address some alternate solutions; it was ultimately determined that the architect of record must determine the solution that will be incorporated in this project. [1, 2, 3, 4, 5, 7]

Dormer Coping
Extensive discussion also occurred relative to the dismantling, repair and reconstruction of the terra cotta coping elements on the roof dormers. Many of these units are in poor condition and it should be assumed, for budgeting purposes, that 100% must be replaced. It was felt that there are skilled laborers in Milwaukee who are capable of performing this work with limited damage to intact units. Similar to previously mentioned items, if this work is not performed during this restoration project, it is likely become critically necessary long before the next extensive restoration effort. Water infiltration that would result because these units continue to deteriorate is certain to cause damage to masonry elements that will undergo restoration during this project. It was finally determined that the budget should include the possibility of dismantling and reconstructing (with flashing where possible) the copings. Extensively damaged elements may be replaced with new terra cotta units that match the original design.

Seventh Floor Sills
Water infiltration into window sills on the seventh floor (as well as at a similar condition at the third floor balusters) poses a difficult challenge that must be left to the architect of record for this restoration project. Several solutions were mentioned each of which has pros and cons to be considered: Replacing damaged units in their original configuration is historically accurate but will not prevent water infiltration. This is due to snow and ice buildup behind the freestanding columns that occur within each sill. Flashing over the sill elements completely will prevent water infiltration but could also result in an unsightly and historically unintended and inappropriate appearance, regardless of the type of metal that is used. The proposed solution of raising the sills by shortening the window sashes might prevent water from backing up into the sills but may not be acceptable from an historic preservation perspective. A solution that met with favor is to simply flash the lower frame of the windows. This should be explored during the design phase of this project. The group agreed that it is prudent to carry the cost of complete flashing of these sills in the budget estimate.

General Discussion
Although terra cotta is susceptible to damage from pointing tools, the extent of joint deterioration is such that 100% repointing is recommended. [6]

Although it is theoretically desirable to leave as much of the original terra cotta as possible intact, it was ultimately agreed by the reviewers that highly deteriorated areas should be fully replaced. Materials left in place in difficult to access locations is likely to deteriorate in the near future requiring further intrusion into the building fabric shortly after this major restoration is complete. Also, strong opposition was voiced to the alternate solution of face-pinning marginally damaged units. For these reasons, the group ultimately supported budgeting for complete replacement of the gables above each clock. It was agreed that the WJE report should include a more in-depth review of the current condition and near-term deterioration potential of areas including the flat arches in the tower and window soffits and lintels. [8, 9, 20, 25, 35]

The group concurred that the preparation of an historic Structure Report should include an effort to locate the original terra cotta shop drawings. [10]

It was agreed that hollow metal rods described on page 19 of the WJE report are probably wrought iron, not cast iron. [11]

WJE explained that terra cotta mullions in front of stained glass windows as well as large decorative terra cotta mullions on the center gable portions of the east and west facades crushed as a result of load transfer induced by a locked top joint or inadequate allowance for expansion. The terra cotta is a cladding over masonry backup. Damage in other areas of terra cotta was felt to be primarily the result of water infiltration. Sealants installed during the 1970's may have contributed to this, but the damage is evident in historic photos taken prior to this work. It was speculated that epoxy repairs on the face of terra cotta

units may have prevented some damage by limiting water infiltration but they are unsightly and have failed due, in large part, to poor workmanship. [16, 17, 18, 19]

It was agreed that a unit-by-unit inspection must be conducted during construction in order to determine the exact quantity of terra cotta units in need of replacement. [22] It was also clarified that the estimate for replacement of 7th floor soffits included 25% of the soffits.

It was recommended that while the installation of a breathable coating on portions of terra cotta units with minor spalls, as recommended by WJE, is appropriate, alternate products must be researched. [26]

All of the attendees agreed that cast-in-place concrete (not to be confused with the precast concrete modillions) that had been installed in lieu of terra cotta replacement units during previous repairs must be replaced with new terra cotta elements that match the original design. [36]

Terra Cotta Session Notes:
* This issue was addressed in greater detail during the Brick session when mortar type was discussed.

Questions 12, 13 and 14 were addressed when the need for a structural analysis and monitoring were discussed during the Brick session.
Questions 24, 28, 29, 31, 32 were addressed during the Brick session.
Questions 21, 23, 27 and 34 were addressed during the Precast Concrete session.
Question 30 was addressed during the Steel session.

SANDSTONE

The condition of sandstone materials on the building was reviewed including:

- Cracks
- Water Related Distress: Erosion, Delamination and Efflorescence
- Spalls
- Abandoned Anchors
- Discoloration

Recommendations were then presented from the WJE report and written questions were addressed.

Delamination
It was determined that an allowance should be provided for a range of repair options that will be necessary. Refacing or dutchman techniques will be used depending on the depth of deterioration. Redressing will only be done in badly exfoliated areas. [12] WJE is confident that delamination is the result of water rundown rather than atmospheric pollutants because of the nature and location of the damage. [10] The introduction of surface consolidants is not advised as it may merely cause larger pieces of stone to fall from the building rather than the small pieces that currently exfoliate. [15, 20]

It was recommended that dutchman repairs should extend the full height of the original stone units in order to avoid causing a "patchwork" appearance. Methods of attaching dutchman repairs of 2-inch thickness or less were discussed at length. It was explained that fastening through the face of units will be only slightly visible as sandstone plugs will be placed over the countersunk anchors. These anchors are somewhat flexible to allow movement within the stone and are intended primarily as a safety precaution to prevent units from falling if future damage occurs. An alternate suggestion was to use embedded angles, painted to blend with the stone, at the edges of units. It was felt that replacement of complete units might avoid the need for anchors but would be too invasive an approach. [16, 17, 21]

Joints
Further research must be done to determine the original profile of mortar joints. The original specifications called for struck joints but there is evidence of joints with beaded profiles. There is no evidence that the beaded profiles are original. The life of a beaded profile is estimated at between 50 and 70 years so it is possible that much of what might be original beading has eroded away or that beading was added during pointing work during the life of the building. [1, 7, 8]

Recommendations regarding mortar (also referred to as "grout" in the WJE report) and sealant made during the Brick discussion also apply to areas of sandstone. It is thought by some that the installation of mortar in horizontal (skyward) joints prior to the installation of sealant might restrict thermal movement and damage stone facing further. [2, 3, 4, 5, 6]

Broken Units
WJE stated that cracks in the sandstone are thought to be the result of thermal movement rather than settlement because no differential vertical movement was observed. In addition, cracks are in locations typical of thermal expansion and contraction problems.[9] Opposition was again voiced against the use of sealants to fill cracks that have resulted from thermal movement. It is felt that sealant will discolor and attract dirt quickly. It can also trap damaging moisture behind the surface of the stone and exacerbate exfoliation problems. As discussed during the Brick session, it is felt that mortar with a lower compressive strength than the stone could be used in thermal cracks. Because of its lower strength it can be "flexible" allowing future thermal movement. A struck joint surface will match surrounding construction will also allow moisture within the stone assembly to escape. It was agreed that this decision

is ultimately the responsibility of the architect of record. [22] Replacement of lintels will be added as a possibility in the WJE report.

Surface Discoloration

The heavy staining was observed to be directly related to abandoned anchors, which are to be removed, and to diesel exhaust from County transit busses. Both types of staining can be removed through cleaning. [13] Light rust staining also appears in most of the sandstone surfaces as a result of the oxidation of minerals naturally contained within the stone. Although this can be removed and reformation can be inhibited, the preferred approach is to leave it in its present state. Care must be taken when selecting replacement Berea sandstone (which is still quarried). It is available in both gray and buff colors that sometimes have heavy orange coloration at the time they are removed from the ground. Replacement stone should selected and be aged naturally (not pre-patinated) above ground for several months prior to installation to blend as well as possible with the original stone. [11, 14, 19]

Drip Detail

The original construction drawings were reviewed during this session and it was determined that a drip edge was originally included in the location where a copper drip had been installed during previous repair / restoration work. The stone drip had probably eroded over time and the copper replacement was found to be ineffective because of its shallow depth. It was agreed that a new drip could be cut into the edge of the stone to closely approximate the original profile. [18, 23]

GRANITE

The condition of granite materials on the building was reviewed including:

- Staining and Discoloration
- Abandoned Anchors

Recommendations were then presented from the WJE report and it was determined that written questions had been adequately addressed during previous discussions.

A final recommendation was made that the maintenance staff should be disallowed from applying ice melting agents, especially calcium chloride and sodium chloride (salts), adjacent to the building.

PRECAST CONCRETE MODILLIONS

The condition of precast concrete modillions installed during the 1973 – 1974 restoration was reviewed including:

- Coating Failure
- Limited Cracking and Spalling

Recommendations were then presented from the WJE report and written questions were addressed.

Coating
It was discussed that a three coat tinted limewash could be applied to recolor the surfaces of these units to match the adjacent terra cotta elements if the precast elements are to be retained. This coating is expected to last fifteen years and will not peel away like a painted coating.

Replacement of Units
Although many of these units appear to be in good condition, the group agreed that they are an inappropriate modification to the historic materials of the building. Terra cotta units matching the original components that have been removed should be installed. It was recommended that further testing should be performed to determine the degree and depth of "carbonation" present in the concrete material surrounding the reinforcing steel. Also, the potential presence of chloride additives in the original concrete mix should be determined. Chlorides, which accelerate steel corrosion, were common additives at the time the replacement modillions were produced. [1,3,4]

The steel support system for the original terra cotta units has completely deteriorated and must be replaced in order to restore the original construction details. The installation of new units and support steel will probably require the reconstruction of the entire cornice and gutter assembly. It was recommended that $650 per lineal foot of cornice should be carried in the project budget. This money will be necessary if testing indicates that the units are near the end of their functional life and will deteriorate prior to the next major building restoration project. Reviewers agreed that it is very likely that the units will require replacement in a relatively short period of time. [2]

MASONRY CLEANING

Masonry cleaning procedures and techniques were reviewed including:

- Removal of Existing Coatings
- Removal of General Dark Surface Soil and Stains

Recommendations were then presented from the WJE report and written questions and comments were addressed.

Test areas were presented in photographs and also as part of the building tour. Further testing will also be performed during warmer weather. It was determined that the recommended cleaning agent left no residue on the surfaces of cleaned materials. A requirement for testing each surface to be cleaned during this phase of work on the project is also recommended for the project specifications. The group agreed that a gentle cleaner would provide the aesthetic that is desired and that more aggressive agents, which could cause damage to masonry materials, must be prohibited. Materials and methods will be clearly presented in the WJE report and these procedures must be clearly stated in the construction documents. [2, 3, 4, 6, 7, 8, 9, 10]

The WJE intent of cleaning the building is not to make it look new again. The intent is to remove organic airborne deposits, mineral stains and dust after masonry pointing is complete. It will also provide the best potential for matching the color of new terra cotta glazing to that of the original units (sequencing and timing of pointing, cleaning and terra cotta production is important). It was also recommended that analysis should be performed on different masonry surfaces to determine whether or not corrosive pollutants are present. It this is the case, selection criteria for cleaning agents should include removal of these residues. [1, 5, 11]

STEEL

The condition of structural steel was reviewed including:

- Corrosion of Exposed Steel
- Corrosion of Embedded Steel
- Deteriorated Clock Faces

Recommendations were then presented from the WJE report and written questions were addressed.

Structural Analysis and Steel Member Inventory
As mentioned earlier, the Peer Review Group agreed that a structural analysis of the building, particularly the clock tower, followed by a period of monitoring actual forces and movement within the structure, is necessary. It was also suggested that a proactive approach should be taken toward corrosion and deterioration of steel elements. In the past, repair work has been reactive and is likely to have caused damage to building elements that could have been avoided. WJE agreed that an inventory and analysis could be performed for each steel element so that present conditions can be ascertained and a schedule for remedial repairs as well as preventive maintenance can be developed. It was agreed that $1,000,000 should be added to the restoration budget to accommodate the cost of any mitigation work that is found to be necessary through this analysis. [1, 2, 3, 11] Because the framing dates from a transitional period in the history of steel making, it was recommended that coupons be tested from various members to determine their properties, particularly brittleness and strength.

Materials and Construction Methods
It is felt that epoxy anchors provide the best and most reliable connection of supplemental support steel to masonry at the clock gables. [6] Mechanical anchors used to attach new tenth floor guard rails will be of stainless steel materials to avoid future electrolysis and corrosion. [8] Details of replacement steel work are not a part of the WJE report and will be developed during the construction documentation phase of the project. [9] Methods of cleaning existing steel members that are to remain in place will be recommended in the WJE report but ultimately must be tested and selected by the architect of record. [12]

Cathodic Protection
The group felt that cathodic protection may be a valid approach to long term protection of structural steel elements. Although there are some discontinuous steel elements, there are also extensive portions, such as the tower structure, that are continuous and lend themselves to this type of protection. Mock-ups should be installed and monitored to determine the effectiveness of this solution. [7]

Protective Coatings
Three part Tnemec coating is recommended in the WJE report but final selection of this system will be the responsibility of the architect of record. The architect of record must also determine methods for the abatement of lead contained in the original steel coatings. [10] It is acknowledged that any original coating that is intact could be left in place as it is likely to outperform any presently available coating products. Therefore, the issue requires further study, as total abatement may be unnecessary.

The installation of flashing was also recommended where possible as a means of protecting steel elements from moisture within construction assemblies.

Clock Faces
It is thought that the original translucent clock faces were constructed of glass. The intent of this project is to remove the corroded steel faces and to install new faces that replicate the original faces. [4, 14]

Tower Stair
The tower stair occurs within the open upper levels of the tower and, although protected from rain exposure, is exposed to the atmosphere. It is unclear whether or not the tower stair is original. Full replacement is not planned at this time. [6,7]

Historic Elements
Existing exposed elements such as railings within the tower should be reviewed from the perspective of historic appropriateness during the Historic Structure Report phase. It is unknown at this time whether or not these elements are original. Care should also be taken if new units are installed so that anchoring occurs through mortar joints rather that through the face of masonry materials. [15]

It was recommended that cast aluminum is not an appropriate material for replicating roof cresting that has been removed. This is due to inherent weakness of the material as well as the difficulty associated with ongoing maintenance of anodic and painted coatings on aluminum materials. Cast iron with a high performance paint system that includes a zinc rich epoxy primer will provide appropriate strength and maintainability.

General
Unclear or confusing portions of the WJE report, such as the inspection information that supports the recommendations for the Clock Gables, will be modified to be easier for readers to navigate and understand. [13]

ROOFING AND FLOOR DECKS

The condition of building roofing was reviewed including:

- Tower Copper Roof
- Tower Flat Roof (Floor Decks)
- Main Flat Roof (installed in 1997)
- Slate Roof
- Roof Gutters
- Clay Tile Roof Decks

Recommendations were then presented from the WJE report and written questions and comments were addressed.

Tower Roof – Slate versus Copper
There was lengthy discussion regarding the appropriateness of replacing the tower roof with copper sheeting to match the current materials or to replace it with slate to match the original construction. The original slate failed and was replaced with copper for reasons that are unknown at present (one postulation is that iron nails, commonly used during the original period of construction, corroded and resulted in falling shingles). If slate were installed, careful detailing will be necessary to prevent dangerous conditions resulting from falling shingles. Once it has been determined, the flexibility of the structural frame must also be taken into consideration for this type of roofing material. The selection of slate may cost an additional $500,000 but it was felt that the present budget would accommodate this cost. It should be noted that if slate is installed on the tower that it may be necessary to replace all of the slate on the main building roof to provide a cohesive appearance.

Copper has been in place on the tower roof for most of the buildings history and it is unlikely that most people are aware that a different material had been used originally. The appearance of the building will be dramatically changed by the installation of a new copper roof. It will have a shiny appearance briefly before it turns to a dark, dull brown. It is possible that the green patina present on the current roof may never be achieved due the lack of certain pollutants in the atmosphere. Despite this, it was strongly recommended that pre-patinated materials should not be used if copper is selected as the replacement material.

This is both a preservation and community perception issue. The City, in conjunction with the architect of record, must ultimately make the decision based on information developed for the Historic Structure Report. [1]

Main Building - Slate Roof
The type of slate used on the main roof was unknown during this discussion but will be determined through the research of City records of the 1973 – 1974 installation. Once this has been determined, the potential remaining life of this roofing material can be estimated. [2, 3] It was also observed during the building tour that the slate may have been fastened too tightly during the installation causing lifting of bottom edges of some of the shingles as well as fracturing of some units.

The reviewers felt that it is desirable to remove the slate adjacent to the dormers to allow for the installation of an adhered ice and waterproof membrane. It was felt that heat trace is only an additional measure of protection and cannot be relied upon as a sole solution. [7] The extent of material replacement in this location is extensive. This factor, combined with the extent of slate removal at the peak of the roof to allow for the installation of cresting and pressed metal trim panels, may warrant full reroofing of the slated areas. A figure of $51 per square foot was recommended for the restoration budget.

Gutters
The gutters must be replaced with a properly designed and detailed system. Concern was voiced by several reviewers over the type of metal proposed for this system. It is historically inappropriate to introduce another type of metal and, from a practical standpoint, may deteriorate quickly due to galvanic action. It was felt that a copper system would work well with other metal elements on the building and could be properly detailed to prevent staining of masonry surfaces below. [8, 9]

Flat Roofs
Opinions regarding appropriateness of different flat roofing materials varied widely among the Peer Review Group. The selection and detailing of replacement roofing in flat areas must ultimately be left to the architect of record. [11, 14]

Questions 4 and 5 refer to issues that must be addressed as part of the construction documents.
Questions 6 and 12 were addressed during the Brick and Terra Cotta sessions.
Question 10 was addressed during the Steel session.

WINDOWS

The condition of windows and doors was reviewed including:

- Sash and Frame Weatherstripping
- Insulated Glass Units
- Waterproofing
- Hardware

Recommendations were then presented from the WJE report and written questions and comments were addressed.

Insulated Glass Units
The figures for units in need of replacement will be presented in the final WJE report. [1] Although energy cost savings do not alone warrant the use of insulated replacement units, other factors such as occupant comfort and condensation, may. Although glazing pockets should be modified to provide for weeping of moisture, it is possible to receive a warranty (from a manufacturer such as Cardinal) for glazing units set in unwept pockets. [2, 3] Historic woodwork and hardware were removed at the time of the installation of insulated glass units during the 1970s. This makes it impossible to preserve and restore original sash and less necessary to consider the use of single pane glazing. [4, 5, 6, 7, 11, 12] Note that some lower sash and glazing may be reduced in size as part of the main building seventh floor gutter reconstruction to help mitigate water infiltration.

Stained Glass
The condition of stained glass was not included in the WJE study. It was recommended that careful attention be paid toward proper venting if new protective glazing is installed outside of the stained glass panels. The stained glass should be monitored as part of the building's cyclical maintenance plan. [8]

General
Doors were not reviewed in the WJE report. [9]

Clarification was provided regarding the detailing of new weatherstripping and bulb gaskets were recommended as another potential solution. [10]

Roof skylight is new and was not included in the WJE report. [13]

It was recommended that the interior skylight surfaces should be cleaned as part of the building's cyclical maintenance program.

CONSTRUCTABILITY AND COST

Contract Type

It would be difficult or impossible to carry out a complex restoration project properly and to achieve the quality and cost control necessary for a landmark building through traditional low-bid methods. The group agreed that it will be in the best interest of the City to hire a construction expert prior to the construction documents phase. This expert will provide guidance for constructability, budgeting, MWBE issues, scheduling and phasing of the work. It was agreed that the Construction Management approach could add 3 to 4% to some of the costs of the project but that it might also provide savings of similar magnitude in other areas. It was ultimately deemed more appropriate than the alternative approach given many unknown conditions inherent in projects of this nature.

Because certain limitations and regulations exist for municipalities in the State of Wisconsin, it may be desirable for a legislatively created entity to be created that will then contract this work. This method has been used in several successful projects in the City of Milwaukee including the recently completed Miller Park and Midwest Express Center. Another possibility is that a public benefit corporation could be created to act as the cities agent for the project. [1, 4, 7, 9, 10, 19, 21]

Although concern was raised over owner-direct purchasing, it was determined that it has effectively been used in the past as a means of saving the cost of sales tax on the purchase of materials. It can also help to maintain consistency of material lots and assure that procurement of items with long lead times does not negatively impact the construction schedule. Purchase order support documentation must be produced by the Contractor or Construction Manager and accompanied by an official purchase order from the City. [11, 17]

Although security at City Hall is presently high, it is felt that this issue, as well as life safety, must be carefully reviewed, planned and maintained during the course of the work. [5]

Budget

It is felt that there is enough money in the budget to cover the costs associated with material testing and insurance. This will be clarified in the budget that is presented in the final WJE report. [12, 13] The final nature of bonding and insurance will be determined by the City and Construction Manager.

It is felt that there is no alternative to scaffolding in terms of safety and accessibility. It will also be difficult to phase work by sections of the building or trades. [2, 3] There is enough money in the scaffolding budget to cover all of the associated costs including protection of building surfaces, maintenance and phasing. [14, 25, 26, 27, 28]

Grants and other funding sources for this type of project should be researched as a part of the Historic Structure Report and National Historic Landmark application process. It is likely that a development consultant may be required to solicit outside funding sources. [6, 8] Public promotion possibilities will also be reviewed during this time period.

It was felt that the escalation costs included in the budget are low and that they should be 11% over the course of four years. The WJE team explained that a cost of 4% per year was applied only to portions of the work which are to be completed in future years. This figure will be verified before the budget is finalized and presented. [22]

The costs associated with relocating City employees is not anticipated to be very high and will be specifically excluded in the restoration budget. [15]

The unit cost of terra cotta will be reviewed and revised if necessary. [18, 20]

Budget items including General Conditions and Overhead and Profit were questioned. It was ultimately determined that these numbers will not be revised at this point in time in order to accommodate different contracting methods. [23, 24]

Schedule
A three month gap between the time of study approval and construction document preparation was provided for the selection of the preservation architect. [16]

GENERAL

Temporary Stabilization

It was recommended that the temporary stabilization measures should be inspected on a semi-annual basis. Also, a three-foot high "eyebrow" should be installed on the pedestrian cover to help capture falling debris. The present protective cover should also be extended to the face of the curb to assure maximum possible protection.

Cyclical Maintenance Plan

It was agreed that a cyclical maintenance plan must be developed. It should be based on the actual extent of restoration work that will be performed as part of the current project.

HABS

It was recommended that the information generated during this project should be submitted for inclusion with existing HABS documentation.

Interior Finishes

It was recommended that the significant water damage adjacent to windows in Room 801 should be addressed in the final WJE report.

General Peer Comments

General comments received from the Peer Review Group were reviewed by WJE and will be implemented in the final report where appropriate. These items were not discussed as part of the peer review meetings.

Section III

WJE | ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

Compilation of Peer Review Comments
22 February 2002

The following list is a compilation of all peer review comments received by 22 February 2002. The comments have been organized by subject, generally following the organization of the WJE report and the peer review meeting agenda. Within each subject area, comments are generally organized by sub-topic for ease of reference. The name or initials of the peer reviewer or his/her firm providing the comments are included following each comment.

Brick

Comments on Mortar, Pointing, and Joint Treatments

1. Was a test completed to determine the compressive strength of the historic mortar? Or for the replacement mortar (from previous repointing)? Was there a test completed to determine the compressive strength of the brick? (CMB)

2. Are there any photographs of the mortar/repointing test areas? Grinding tools can be difficult to control on a 1/4" joint. (CMB)

3. Is the pointing mortar that exists in each location the same as specified (Portland cement mortar/lime mortar/natural cement mortar)? (JGWA)

4. How was mortar analysis carried out to differentiate between portland cement, natural cement, and lime mortar (JGWA)

5. Repointing technique – use of power tool grinding can be damaging to brick. Limiting its use to only horizontal joints can be less problematic. (JGWA)

6. Agree with observation that "face grouting" is inappropriate pointing technique for building. (JGWA)

7. Point joints – can this be recommended without knowing composition of construction mortar and pointing mortar in each location? (JGWA)

8. The original/historic mortar in various materials should be examined and tested to determine how closely they conform to original specifications. Generally it is recommended that mortar joints be raked out to depth of twice the width of the joint. In some cases, this depth may not be sufficient. (JGWA)

9. Need to determine original/historic tooling of pointing mortar. (JGWA)

10. Re: Pointing joints. Method is good. Has the compressive strength of the existing brick and mortar been tested to know that Type "N" mortar is appropriate? 100% repointing will make the building look "new". Is that the desire? (CMB)

11. You are specifying the mortar joints to be ground out ½" using power tools and hand tools. I would recommend ¾" mortar depth. (Krouse)

12. Did the scope of the investigative work include any moisture meter readings taken at different depths of the masonry walls at different locations? (Speweik)

13. Was the original building mortar(s) too strong for the masonry design? (Speweik)

14. What is the expected compressive strength of a 1:1:6 mortar after 28 days? (Speweik)

15. It appears the original architect did not desire face brick mortar joints larger than ¼". Do the tight joints restrict the overall flexibility of the masonry wall? (Speweik)

16. What benefits are gained by installing mortar in three lifts during pointing? (Speweik)

17. Why is one mortar type, Type N mortar, specified as the replacement mortar for all masonry repairs? The granite, sandstone, face brick, back up brick, and terra cotta all have different vapor transmission rates and thermal expansions. Should the repair mortar take this into consideration in the effort to establish some compatibility? (Speweik)

18. What are the key performance criteria for the replacement mortar(s)? (Speweik)

19. If the cream colored back up brick expanded twice as much as the face brick, then how is it that the cream colored backup brick is not cracked? (page 12) (Speweik)

20. I am interested in specific details of the aggregate sized lumps of hydrated lime found in the sample. Aggregate sized lumps of lime found in mortars from this period are generally a result of lime putty not being thoroughly mixed with the sand. Reference - Mortar Analysis – MSE 1 t is interesting that lime was found in this sample. The original specifications only called for Milwaukee cement and clean lake sand with Rickertsen's mineral mortar color. (Speweik)

21. What is the life cycle performance of the sealant proposed for the horizontal joint surfaces? (Speweik)

Comments on Observations and Discussion

22. On page 13 of the report, you conclude that the vertical cracks in the south bell tower at the 10th floor arches and 12th floor flat arches are "...likely related to overall thermal expansion and contraction of the wall, although the cracks may originally have occurred as a result of moisture expansion of the backup brick. Thermal movement produces tensile stresses in the masonry wall, which cracks at points of discontinuity, such as the keystone of round arches and the ends of flat arches. This appears to be the cause of the large cracks vertically through the center arch in each facade of the Tower at the 10th floor, as well as the vertical cracks at either side flat arch on all four facades of the Tower at the 12th floor."

    Although differential movement between wythes of masonry due to thermal and moisture expansion can produce tensile stresses within a masonry wall system, our preliminary findings at the building in April 2001 and our review of the investigative findings presented in your report do not support your conclusion that this phenomenon is the primary cause of the vertical cracks in the locations reported above.

    Horizontal and vertical differential movement between wythes of masonry will likely cause bending stresses (similar to bi-metallic effects) in the wall, resulting in cracks on one side only (not through cracks as we have seen and as you report). Under the bi-metallic bending assumption, both vertical and horizontal cracks should be observed in these locations. However, only vertical cracking is reported. A more probable mechanism causing this cracking is related to arching action of the masonry over the groups of wall openings at the 10th and 12th floors. It is likely that the resulting tension from arch thrust is cracking the wall at head levels.

Vertical compression in the masonry walls, from gravity and wind loads, will be carried, to some extent, by arching action in the wall to the large, stiff corner piers. Since there is no thrust reaction at the corner piers, the arching action creates horizontal tension forces in the wall at the levels of the tops of the openings. Such tension is consistent with the vertical through-wall cracks that we both have observed at the heads of these openings. It is important to note that the floor diaphragms at the 0th through 13th levels serve to help restrain the lateral spreading of the corner piers that is induced by arch thrust.

Based on our observations and the observations recorded in your report, we suspect that the mechanism described above is the probable explanation for the vertical cracking in the 10th floor arches and 12th floor flat arches. We recommend, therefore, before any repair work is implemented that a structural study of the tower be commissioned, including further investigation of the existing conditions of floor decks and their interaction with the masonry. We also recommend that any further analysis be verified through physical monitoring of the tower. (SGH)

23. Are the existing bricks the same as specified for every location? Report is not clear. (JGWA)

24. Is it possible that clock gables have always been out of plumb? Are they stable? (JGWA)]

25. Surface deterioration – was Energy-Dispersive, X-Ray analysis used to determine composition of atmospheric pollutants on brick surfaces causing eroding, pitting, and spalling? (JGWA)

26. Moisture level tests appear to be needed to help determine causes of brick deterioration below main cornice at 7th floor. (JGWA)

27. What is recommended testing to determine cause of cracking at 8th floor level, both where steel exists and where masonry was rebuilt in 1973-74 without it? (JGWA)

28. Was there a determination made as to the cause of the "out of plumb" gable walls? Were the walls built that way or is it a structural issue that must be addressed? (CMB)

29. Was there any determination (by observation or testing) of the composition of the white and black streaks on the brick? (Mildew? Calcium chloride? Carbon deposits?) (CMB)

30. Agree that it is likely the improper water pressure pitted or eroded the brick surface; it is not so likely that spalling was caused by the same. (CMB)

31. Re: thermal movement. Mortar is the sacrificial part of the brick masonry system. If the system is properly assembled, should not the mortar crack instead of the brick during thermal movement? Is there another possible reason for vertical cracking? (CMB)

32. Re: Clock gables. Several possible reasons are stated for the gables being out of plumb. Is it possible to narrow down the reasons? Are they leaning in or leaning out? (Outward leaning is implied, suggesting something other than wind load.) Were they built that way? Is there adequate bearing for members that bear on the gable walls? Are the wythes of the brick acting together or have they separated? (CMB)

Comments on Recommendations

33. Good idea to replace steel only if there is significant section loss. With what will it be replaced? More often steel will be repaired. Sandblasting not recommended if steel is adjacent to brick or terra cotta. (CMB)

34. Re: lateral wall ties. Are there currently any lateral wall ties in the system? If not, what is the indication for their addition to the system? What material is recommended? (CMB)

35. Have the areas that are called for "rebuilding" been reviewed from an aesthetic perspective as well as an *ease of repair* perspective? How visible are each of these locations? Should any of these locations be considered for reuse of existing brick to protect the appearance of the building? (CMB)

36. Helical ties are a good method of anchoring the wythes of brick together. What material are the ties? Are they installed in the new mortar joints? (CMB)

37. Have the structural reasons for the cracked bricks been determined? Is it possible to rectify the structural problem? (CMB)

38. If brick is being replaced in some areas, should not the cracked bricks be replaced? Is new sealant the proper repair for this problem? (CMB)

39. Will there be any repair method to accommodate future movement in the face brick? (Speweik)

40. Has it been determined that the stained brick cannot be cleaned? Is replacement the proper approach? (CMB)

41. Agree with observation that use of epoxy is inappropriate repair technique for cracked brick. (JGWA)

42. Has it been definitely determined that original construction, both with embedded steel and without, must be dismantled and rebuilt (report is not clear)? (JGWA)

43. Need more information on helical anchors and how they can be installed without damaging historic brickwork. (JGWA)

44. Using salvaged brick can be problematic because of loss of adhesion with new mortar. (JGWA)

45. I cannot find a systematic plan to solve the problem of thermal movement and expansion. Will there be a plan detailed prior to the commencement of this project? (Krouse)

46. The document makes mention of the 'average expansiveness percent' for the face brick and the backup brick, however, I cannot find any data supporting this finding. Please explain. (Krouse)

Terra Cotta

Comments on Mortar, Pointing, and Joint Treatments

1. Seal cracks – is there a more appropriate repair than sealant? (JGWA)

2. Point joints – is Type N mortar best choice? (JGWA)

3. Seal joints – should replace large voids in mortar with new mortar before applying sealant in horizontal joints. (JGWA)

4. Semi-circular joint covers–further clarification, including material, should be provided. Were they original? (CMB)

5. Pointing. Is type N appropriate to the compressive strength outlined by WJE tests? Does type N meet the color and texture requirements to match the historic mortar? (CMB)

6. Terra cotta is very susceptible to edge damage by use of repointing tools, would it not be prudent to consider maintaining any existing tight joints? (CMB)

7. Seal joints. Has the compatibility of the sealant and the terra cotta been researched? Silicone sealants tend to attract airborne carbon and to look dirty. Has the option of the traditional method of repairing joints been explored (cleaning the joints and replacing with compatible mortar)? (CMB)

Comments on Observations and Discussion

8. The following three major areas of the terra cotta repair will likely drive the overall cost and be the most debatable issues: clock gables, soffits, and flat arches. (SGH)

9. We also do not find in the report an assessment of the flat arches over the rectangular windows in the main building. Based on your openings and the reinforcement found in the flat arches in the tower, it is likely that the flat arches are similarly reinforced and may pose a future falling hazard, which is not discussed. We recommend that a more detailed study of the soffits and flat arches be conducted to better determine and predict the quantity of required replacement and future maintenance issues. (SGH)

10. Every effort should be made to locate original fabrication/shop drawings because they will be invaluable in restoration – this could be part of historic structure report work in next phase of project. (JGWA)

11. Page 19 – hollow metal rods probably wrought iron and not cast iron. (JGWA)

12. Should there be more structural analysis of areas where there is failure and/or displacement? (JGWA)

13. If it hasn't been done, Energy-Dispersive X-Ray analysis should be used to determine composition of atmospheric pollutants on surface of terra cotta to determine if they are damaging. (JGWA)

14. Is the described vertical cracking in the terra cotta flat arches located in the terra cotta units or in the joints? Same question for the cracking in the clock gables. By noting WJE observations at these two points, the cause for cracking on the gables is the splay in the corroded steel. The same is not true for the flat arches. Is this correct? (CMB)

15. Were the terra cotta units pinned (October 2001) through the face of the terra cotta? (CMB)

16. Have load calculations been completed to determine if additional support is needed at the locations where (terra cotta) crushing has occurred? (CMB)

17. Are there steel or cast iron supports/reinforcing in the mullions? (CMB)

18. Is there a disproportionate amount of credence given to the unaccommodated expansion in the terra cotta (and brick)? Water damage is great, both by erosion and by freezing, though the freezing damage may be exaggerated because of the sealants applied in the 70's that did not allow water and soluble salts to escape from the masonry. (CMB)

19. Why did the epoxy repairs fail in the terra cotta? (Speweik)

Comments on Recommendations

20. On page 24 and 27 of your report, you recommend replacement of "about 10 percent" of the clock gable terra cotta and pinning "about 60 percent" of the remaining (including installing sealant in cracks), respectively. In addition, on page 26 you recommend replacing terra cotta "At the upper portion of the four clock gables, dismantle wall and coping units down to the line of the embedded diagonal steel beam; replace damage units, rebuild gable following steel repair." (SGH)

    We agree that the amount of distress in the clock gables is significant. As you point out in your repair recommendations, 70 percent or more of the clock gable terra cotta requires some level of intervention. Replacing such a small quantity of terra cotta in the clock gables will require constant monitoring of the remaining terra cotta pieces. In addition, the sealant will require replacement on an on going basis and will be only marginally effective in keeping water out of the wall system. (SGH)

    Given that an overwhelming percentage of the terra cotta requires repair, the ongoing monitoring required of the retained terra cotta, and the difficulty and cost to gain access, we suspect it will be more economical on a life-cycle cost basis, and certainly more reliable and durable, to replace all the terra cotta in these locations at this time. Making the repairs that you recommend does preserve the historic fabric. This needs to be weighed with the cost of maintenance and the overall wall performance to perform the correct scope of repairs. We do not believe that continuing maintenance of the terra cotta on the clock tower faces is a viable option. We also agree that the soffits on the 7th and 9th floors in the tower should all be replaced due to the level of distress cause by corrosion of embedded metal elements. On page 26, however, you recommend replacing only about 15 of the 7th floor soffits on the main building. We do not find in the report how this number was determined or its basis. (SGH)

21. Precast replacement elements should be replaced with terra cotta. (JGWA)

22. Replacement of damaged units – there should be piece-by-piece inspection to determine exact quantities as part of contract document phase. (JGWA)

23. The recommendation to consider substitute materials such as precast concrete or cast stone should be reconsidered. (JGWA)

24. Need more information on helical anchors and how they can be installed without damaging historic terra cotta. (JGWA)

25. Tower Clock gables - need to examine more carefully to determine exactly how many units require pinning. (JGWA)

26. Paint spalls - what is most appropriate coating to repair terra cotta? (JGWA)

27. The suggested use of substitute materials may be appropriate under WJE recommendations – have substitute materials been investigated? (CMB)

28. New stainless steel anchorage is recommended – is this to replace existing anchors? Or in addition to the existing system? (CMB)

29. "Replace existing steel where severely deteriorated" – with what material? Note that later in the paragraph the recommendation is for stainless steel anchors. (CMB)

30. Cathodic protection. WJE recommends against it. AGREED. (CMB)

31. Pin in place repairs. Is the recommendation for pinning with helical ties through the face of the terra cotta units or in the new joints? (CMB)

32. Seal Crack. If the cracks occurred to allow movement, should not an alternative location for movement be accommodated and then an accepted terra cotta patch method be adopted for units that are not severely deteriorated? (CMB)

33. A terra cotta masonry system typically has weep holes to allow water that has breached the system to escape. Has any consideration been given to identifying and maintaining the weep holes in the terra cotta? (CMB)

34. Referring to WJE's findings on the main building, 7th floor cornice. I am concerned about the excessive corrosion of the 'T' angles that support the cornice. I am also concerned that the replacement pre-cast concrete modillions are near the end of their life cycle, especially when they are spalling from rusting reinforcement that is embedded in the pieces. It might be better to remove, replace rotten steel and reset or replace the cornice, along with the installation of appropriate flashing. (Krouse)

35. The 7th floor soffit level appears to have a rusting 7/8" steel pipe for support. It might make sense to systematically replace these projecting conditions in light of the areas of cracked terra cotta and rusted piping. This would eliminate the possibility of cracked terra cotta falling off the projections. (Krouse)

36. The concrete patches on the building that were done in previous repairs appear to be failing. Is there a plan to remove all concrete patches, or only selected areas? (Krouse)

37. I would like to recommend the use of lead 'T's' on the skyward joints in lieu of sealant alone. (Krouse)

Sandstone

Comments on Mortar, Pointing, and Joint Treatments

1. Observations – need to determine original tooling of pointing mortar. (JGWA)

2. "Grout" is recommended for the "joint" between the stone dutchman and the existing stone. What is meant by "grout"? (CMB)

3. Is Type N mortar best choice for repairing sandstone? (JGWA)

4. Horizontal joints – large voids in mortar should be replaced with mortar before applying sealant. (JGWA)

5. Pointing. Type N mortar is specified. Has the compressive strength of the mortar been compared to that of the sandstone? The mortar must remain the sacrificial part of this masonry system. (CMB)

6. Sealing Joints. Horizontal joints are recommended in this study to have "sealants". Traditional methods include appropriate repointing mortar. Combined with proper flashing, skyward joints can avoid water infiltration more effectively than sealants which are likely to pull away from the stone, discolor the stone, or pull small pieces of the stone from the wall. The life of the sealant may be long, but the life of a sealant joint is no longer than that of a mortar joint, maybe less. Also, use of sealants tends to foster complaisance with regard to regular maintenance inspections. (CMB)

7. Beaded Joint. What is the extent of existing beaded joints? If there is a large extent of beaded joints, repairing the same should be considered. If there is very little evidence of beaded joints, the originally specified intention seems appropriate as stated in the study. (CMB)

8. Original specifications call for the joints to be struck off. This may not be the same as tooled to a concave profile as we understand it today. Reference - page 34. (Speweik)

Comments on Observations and Discussion

9. Cracks - why are cracks thought to be the result of thermal expansion and contraction rather than from other causes such as settlement? (JGWA)

10. Surface distress – could any of the surface damage be caused by atmospheric pollutants? Has Energy-Dispersive X-Ray analysis been done? (JGWA)

11. Rust-colored stains – need to test to determine if caused by corroding ferrous metal and if staining is damaging the stone. Has testing of chemical neutralizers been made? (JGWA)

Comments on Recommendations

12. Redressing of original stone should only be done as a last resort. (JGWA)

13. Abandoned Anchors - should be removed because they will cause problems in the long run. (JGWA)

14. Pre-patinized stone from the quarry is not a good idea. (JGWA)

15. Has use of stone strengtheners (consolidants) on sandstone been investigated? (JGWA)

16. Dutchmen repairs – why do stainless steel spring pins or helical anchors need to be used in every case? Has building been surveyed to determine exact number and location of Dutchmen repairs? (JGWA)

17. Need more information on helical anchors. (JGWA)

18. Cut drip (22) – what is detail of proposed groove and existing copper strip? (JGWA)

19. Iron staining in sandstone. Iron in the sandstone can be cleaned, but it returns very shortly after cleaning. New Berea Sandstone (same quarry) is greatly veined with iron. It may be necessary to carefully select any replacement stone (to avoid too much rust color), but as WJE recommends, attempting to clean the iron from the existing stone or to patinate the new stone are unnecessary. (CMB)

20. Exfoliation of spalling sandstone (surface consideration only) and re-dressing is most likely the best approach to the problems on this sandstone. The sheeting (or layer exfoliation) of this stone is likely aggravated by the coatings that were applied in 1974. If the outer layer of the stone is removed, hopefully, so will be the problem. Honing and tooling will give the existing stone a better appearance without jeopardizing the stone with side effects from consolidants or sealants. Also, per WJE recommendation, re-patinizing or pre-patinizing is not necessary. (CMB)

21. Is the "pinning" recommended in this section through the face of the stone or in the new mortar joints?

22. Is use of sealant for repairing cracks in sandstone the best solution? Have compatibility tests on the sealant been completed? If cracks are due to movement, perhaps a solution should be engineered to avoid using the cracks in the sandstone for the same. (CMB)

23. Re: Drip. Is the copper strip an original detail? Does it work at all? Can it be bent to work? If it could be used, it would save the effort of routing a new drip; if it does not work, the new routed drip should. (CMB)

Granite

Comments on Mortar, Pointing, and Joint Treatments

1. Is Type N mortar the best choice for repointing granite? (JGWA)

2. "Grout" is recommended for the "joint" between the stone dutchman and the existing stone. What is meant by "grout"? (CMB)

3. Re: Pointing. Is type N appropriate to the compressive strength outlined by WJE tests? Does type N meet the color and texture requirements to match the historic mortar? (CMB)

Comments on Observation and Discussion

None received

Comments on Recommendations

4. Abandoned anchors – should be removed. (JGWA)

5. Dutchmen repairs – why do stainless steel spring pins or helical anchors need to be used? Has building been surveyed to determine exact number and location of Dutchmen repairs? (JGWA)

6. Abandoned Anchors. Abandoned anchors should be removed as they allow water into the granite and ferrous anchors will expand as corroding, placing pressure on the granite. (CMB)

7. Partial Dutchman. If areas of "significant surface damage" are less than 4", is a dutchman necessary? (CMB)

Precast Concrete

Comments on Observations and Discussion

1. Although the reinforced precast modillions at the 7th floor appear to be in sound condition with little or no corrosion of embedded reinforcement, we do not find in the report any discussion or analysis of the depth of carbonation in the concrete. An understanding of the depth of carbonation, especially if the steel is contained in the zone of carbonation, is critical to predicting future performance of the modillions. If the embedded reinforcement has lost the passive alkaline concrete layer (through carbonation), corrosion of the embedded steel can initiate. The presence of additives, such as chlorides, that may have been placed in the concrete during casting also must be determined. Chloride additives are known to accelerate corrosion of reinforcing steel, and were not uncommon additives to concrete materials in the early 1970s. We recommend that the modillion concrete be randomly sampled and tested for the depth of carbonation and additive content, if any. (SGH)

2. What is the fastening system for the 1973-74 pre-cast brackets at the 7th floor cornice? Is it strictly counter weight? If it is not counter weight alone, the steel supports should be examined for strength and stability. (Krouse)

Comments on Recommendations

3. Has the proper patch method been determined? (CMB)

4. Unless there is some strong reason not expressed in the report, the precast concrete elements installed in the 1970's should be replaced with new terra cotta. (JGWA)

5. Precast concrete modillion brackets supporting the main cornice could be limewashed in a color to match the surface of the adjacent terra cotta. Reference – page 31 (Speweik)

Masonry Cleaning

1. What is the goal for the cleaning? Is it to make the building look "new" again? Or to remove harmful deposits and previous coatings? (CMB)

2. WJE stated in the study that perhaps the sampling should be completed again in warmer weather, this reviewer agrees. (CMB)

3. It will be helpful for reviewers to see the sampled areas. (CMB)

4. Several methods of removing the coating from the concrete terra cotta replacements were tested. Is there a preferred method? When the solvent-based strippers were used (Peel-Away 7 for example) was the surface of the concrete tested for residues that may interfere with re-applying a coating? (CMB)

5. Need to evaluate atmospheric pollutants on all masonry areas to determine if they are attacking various materials. Once this is done, a testing program can be developed that identifies the least aggressive agent that is effective in removing the pollutants and cleaning the masonry material. It is likely that each material will require a different cleaning method. (JGWA)

6. Need to establish an organized testing program using procedures established for terra cotta (English Heritage) (JGWA)

7. Are there photographs of various cleaning tests, as well as drawings showing location? (JGWA)

8. Masonry cleaning – what mild detergent is recommended? Will it remove corrosive pollutants on brick surfaces? (JGWA)

9. Oxalis acid may not be most appropriate agent for removing ferrous stains. Were other methods investigated? (JGWA)

10. Agree that cleaners containing hydrochloric or hydrofluoric acids should not be used. (JGWA)

11. If the building is going to be cleaned, will the terra cotta be done before or after masonry repairs? It would be preferable for the cleaning to be done after the re-pointing, but prior to the installation of new terra cotta. (Krouse)

Steel

Comments on Investigation of Steel Structural Elements

1. On page 46 you report, "Virtually all those steel elements that are embedded into masonry have a heavy build-up of corrosion. This is due to moisture in the masonry causing a greater rate of corrosion on the embedded steel, and also because the embedded steel elements are not generally accessible for inspection or maintenance. The vast majority of embedded steel elements that were inspected retain sufficient steel section in spite of the heavy corrosion." Even at locations where cracked masonry was coincident with corroded embedded steel, such as at the anchor straps and pins of the beams supporting the 13th floor deck, the cracking in the brick masonry continues well beyond the steel element and does not appear directly related to the degree of corrosion observed."

   In Appendix W18.5 – Clock Gable Framing, you describe the investigation of one of the diagonal embedded beams with a boroscope as "It appeared to be extremely corroded." You further state, "The tall masonry gable wall is braced against overturning movement only by the small steel tees that support the clay tile roof deck. The connection of these tees to the diagonal beam frame of the gable could not be determined." We agree that corrosion of embedded steel elements is a significant problem, which occurs in many locations where steel is embedded in masonry walls. This building's history shows that corrosion of steel elements has been a primary factor behind many of the previous repair campaigns and is likely to be a major repair item for the next. The previous repair campaigns were largely a reaction to distressed or fallen masonry caused by corrosion of embedded steel. Many of the recommendations found on pages 47 and 48 (numbers 30 and 33) are reactive measures, which deal with specific isolated elements. The building's history shows that a repair program that is simply reactive to ongoing corrosion will guarantee another extensive repair episode in the next 10 to 20 years. We recommend consideration of preventative measures now to deal effectively with the causes of the corrosion. You conclude on page 26 that cathodic protection is not appropriate: "Because the steel elements in the building are discontinuous, cathodic protection system would require attachment at every individual steel element, including those elements not otherwise requiring repair." We agree that many steel elements in the main building are discontinuous, but techniques are available to bond these elements together. The frame of the tower spire is continuous, which may make it a potentially excellent candidate for cathodic protection, especially for the hangers and pins at the ends of the floor beams. The potential for cathodic protection requires more study, rather than simple dismissal, as a means to address the root cause of the corrosion problem. Other methods exist to reduce corrosion potential, including coatings and the installation of flashing, and should also be considered. Simply treating the symptom (individual corroded steel members) should not be considered given the building's history. Therefore, we recommend a comprehensive study of all the steel to determine the level of current and future corrosion potential. This study should also include and provide:
   - a list of priorities and a discussion of probable consequences, if repairs are not implemented on a timely basis
   - trial mock-ups to determine the feasibility of cathodic protection and/or any other proposed treatment of the steel
   - a long-term strategy so that corrosion can be dealt with in a forward-thinking manner, which can be planned and executed as needed. (SGH)

2. Shouldn't a structural investigation of the tower steel be undertaken? (JGWA)

3. Page 47 - Can you expand / clarify " a detailed structural analysis of the tower steel was not performed....the accuracy of such analysis would likely be questionable....actual loads are not

known." This directly relates to the recommendation that the entire channel be exposed & patched as needed. (CMB)

4. When were steel clock faces installed? What was original translucent material? (JGWA)

5. Tower spiral stairs – what is "corrosion of fractures"? (JGWA)

6. Is tower stair original? (JGWA)

7. Page 45 - Is the "exposed" steel spiral stair case in the tower exposed to what? Weather? Clarify if you mean that "exposed steel" is not embedded or is exposed to environmental conditions. (CMB)

Comments on Recommendations

6. Are epoxy anchors the best method to attach the steel to the brickwork? (JGWA)

7. Embedded steel elements – need more information on why it is necessary to dismantle distressed brick masonry. (JGWA)

8. Ground rails – new steel rails to be fostered with non-ferrous-anchors – what type of non-ferrous anchors? And how will electrolysis be controlled? (JGWA)

9. Need drawing of how supplemental support is to be installed at clock gate (31). (JGWA)

10. What rust-inhibitive paint system is being considered? How is lead abatement to be handled as part of abrasive cleaning process? Why isn't needle gun being considered to clean steel? (JGWA)

11. Add correction of the source of the corrosion, where possible to the list of requirements, or cross reference to that repair section. In this way there is an understanding of the sequence of work. (CMB)

12. Add testing areas of steel cleaning methods. (CMB)

13. Item 31 - Page 48 The information on the conditions that supports the recommendations here is located in the inspection locations notes. It took some time to find this information. Add a summary paragraph on the conditions of the Clock Gables to the Discussions and Conclusions sections and refer to the inspection locations notes. Item 32 - Page 48 Same as above (CMB)

14. Item 34 - I agree with your recommendation but would have worded it differently. Reconstruction of the original translucent panels, is an appropriate and more desirable approach, than repair of the extant, but not original material. Had the extant material been in good condition, or an easily maintained material, there may have been other alternatives considered. (CMB)

15. Item 35 - There should be some discussion here as to whether it is known that the existing railings are original. Some discussion of repair or replacement of original fabric should be discussed. Similar to Items 31 and 32 there is little or no discussion of this item in the Discussions and Conditions Sections. We recommend that this be worded so that it is clear that the anchors should be imbedded into the masonry joints wherever possible. (CMB)

Roofing and Floor Decks

Comments on Observations and Discussion

1. Need to prepare historic structure report to determine whether slate or copper should be installed on tower. (JGWA)

2. Main Building Slate Roof – what type of slate was installed in 1973-74? Where does 70-year life expectancy figure come from? Life expectancy is completely dependent on type of slate and detailing (fastenings, flashings, etc.) (JGWA)

3. Slate – need to inspect entire roof and determine whether complete replacement is required.

4. Need to determine if any original copper survives and whether it is hard- or soft-rolled. (JGWA)

Comments on Recommendations

5. We agree that the copper on the spire of the tower and the flat roofs on the main building and tower should be replaced. Prior to developing construction documents, we recommend that the flat roofs be tested for asbestos and that the feasibility of retaining the book tiles in the spire be determined. (SGH)

6. We also agree that covering horizontal projections, such as the top of the 7th floor cornice, the 3rd floor sills, and the 8th floor balcony in the tower, with metal flashing is a prudent measure. We would also recommend this repair for the 7th and 2nd floor sills on the main building and bell tower, respectively. Installation of flashing under adjacent windowsills should be considered as part of the work. (SGH)

7. We disagree that installing heat trace in the 7th floor gutters and hopper between the dormers will have a large impact on reducing ice-damming effects along this area. Heat trace is difficult to maintain, breaks down often, and has too limited an area of influence for effectively melting snow and ice. (SGH)

8. Gutters – need to replace existing gutter linings and redesign details. (JGWA)

9. Flashing – terne-coated stainless steel has been replaced with TCS II (a zinc and tin alloy over stainless steel), which has different characteristics from terne (tin/lead). Is the proposed flashing near other metals? (JGWA)

10. Roof cresting – cast aluminum is not a good choice as a replacement for iron. (JGWA)

11. Recommendations - General question: Have the built-up roofs been tested for asbestos? The existence of asbestos will impact costs of removal. (CMB)

12. Item 42 - page 54 Are the joint covers to be reinstalled? A maintenance program for skyward joints should be recommended. (CMB)

13. Item 56 - Suggest that this work be coordinated with the installation of the reconstructed ridge cresting. (CMB)

14. EPDM – Understanding that the life on this type of roof is shorter than other types of roofing, is it appropriate to install EPDM adjacent to materials whose long life you are trying to protect (adjacent materials are disturbed when a roof is replaced)? (CMB)

Windows and Doors

1. We agree that the insulated glazing units (IGU) are likely at the end of their service life. This is, however, too significant an issue to base on speculation. We recommend frost point testing of a statistical sample of non-fogged IGUs to determine their likely future performance. From the description of the leakage paths on page 57, we conclude that an unwept glazing pocket coupled with the use of an interior glazing stop is a significant source of water infiltration. This conclusion is consistent with our observations. (SGH)

2. We agree that, based on energy savings alone, the use of an IGU replacement unit is probably not justified. IGU replacement should be considered, however, for the additional advantages of occupant comfort and condensation resistance. We agree that interior storms can substantially achieve these goals as well as providing a longer service life. (SGH)

3. The presence of an unwept glazing pocket is likely contributing to the IGU seal failure and/or leakage. If the City of Milwaukee requires replacement IGU, the sash should be modified or replaced to provide a wept glazing pocket and watertight interior glazing stops. (SGH)

4. It would be desirable to replace single glazing in historic woodwork. Tests need to be undertaken to determine if heat loss is acceptable. (JGWA)

5. Cylinder glass would not be appropriate, but a modern glass that matches the original early machine-made glass should be used, if single glazing is to be used. (JGWA)

6. Repair wood – Why are epoxy consolidants recommended? Recent experience indicates that there are long-term problems with epoxy consolidants. (JGWA)

7. Is window hardware original/historic? If so, shouldn't it be reused and replicated where missing? (JGWA)

8. Stained glass – when does it date from? What condition is it in? Are cames lead or zinc? (JGWA)

9. There is no discussion in the text on doors. Were they evaluated? (CMB)

10. Item 50 - page 60 Clarify "The shape of the new weather stripping would likely resemble a channel." (CMB)

11. Item 53 - page 60 It is common when installing insulating glazing in a wood sash to route a larger rabbet depth to hold the glass in place. Is there any evidence that this occurred? (CMB)

12. Item 54 - page 60 What was the original window hardware system? (CMB)

13. There is no discussion of the Skylights. Are they in good condition or will any work there be part of this Project? (Hunzinger)

Interior Finishes

1. On page 61, you indicate that the most obvious areas of interior damage are areas of plaster on the inside of exterior walls on the 7th and 8th floors. However, no mention is made regarding the likelihood that the plaster damage on the inboard side of the 8th floor dormer cheek walls is due to ice-damming effects of retained snow behind the snow fences spanning the opening between dormers. This is a likely scenario for much of the damaged plaster, especially the along the cheek walls of the dormers.

   We recommend that this issue be investigated before any repair work begins. If this assumption is correct, the cladding on the cheek walls will require removal and replacement with a back-up waterproofing integrated into the slate roofing underlayment, and eave and gutter flashing.

   In addition, we observed significant leakage adjacent to west windows in Room 801 in the south tower. You do not report this condition, or the causes of the leakage. (SGH)

2. Electrical Lighting – what did original fixtures look like and should they be replicated? (Historic structure report question?) (JGWA)

3. Atrium and Stairwell Finishes – agree with recommendations. (JGWA)

4. No comments, as this work is beyond WJE scope for the project -- it is very general. (CMB)

Temporary Stabilization

1. Until construction begins, we recommend semi-annual inspections be made of the deteriorated portions of the south tower and the temporary stabilization measures installed in 2001. (SGH)

2. Agree with initial efforts to protect public safety by installation of netting and sidewalk bridging. (JGWA)

3. Has there been an investigation and/or study of the condition of the foundation - footings or piling? (Hunzinger)

4. Will the stabilization measures done during the Phase Two study be adequate to provide Life Safety issues during the 3 to 4 year construction schedule? (Hunzinger)

5. The Phase Two study does not explain what structural analysis might be necessary to provide adequate reinforcement of areas where structural steel is more seriously damaged. Will further inspection be necessary from the project scaffolding or has enough information been collected to perform any structural analysis? Is the structure adequate as originally designed or will modifications be necessary to correct any deficiencies or bring the structure compliant with current building codes? (Hunzinger)

6. The entire building restoration scope should be prioritized relative to Life Safety, Water Infiltration, and Structural Damage relative to budget and timing. The vaulted sidewalk repair work required may have an impact on the engineering of the scaffolding placed on it. Additional shoring under the vaulted walks may be required. If the sidewalks are to be filled in, this may not be necessary if done prior to the restoration work. If the vaulted sidewalks are being rebuilt or repaired, the restoration work could be done before or after the vaulted sidewalk work. (Hunzinger)

General

Project Approach

1. The objective of the City for the restoration project is not clearly defined in this report. The report implies that it is the City's objective is to re-establish the original historic features and character of the building, with improved durability features/details to extend the useful life of the exterior facade. In that respect, how is a "long-term" view defined?
   - 100-year repair with routine maintenance, with expected remedial restoration at year 50?
   - 50-year repair with routine maintenance, with expected additional restoration at year 25?
   - Or how else is "long-term" defined? (SGH)

2. In the Phase Two report, I agree with the generally conservative approach taken with regard to the preservation of original materials and the removal of later, lower-quality replacement materials. Decisions regarding replacement of original/historic details will require additional research. (JGWA)

3. There should be more emphasis on non-destructive investigation procedures rather than dismantling sections of original/historic construction. (JGWA)

4. In regard to Philosophy, it will be helpful to have some discussion with the Peer Review Team as to the philosophy of the restoration of the City Hall. What are the particular goals of the restoration project? It will help to understand the driving forces and the theoretical basis upon which the decisions are made. (For instance: a lot of money was poured into restoration in Rome and into cleaning the streets of graffiti in order to make a good impression on cultural tourists during the Holy Year.) (CMB)

Further Testing

5. Are there more tests that have been done and results that can be included (i.e. scientific data, graphs, microphotographs)? (JGWA)

6. No discussion of any lead, mold or asbestos survey was found. Such a survey is normally the Owners responsibility and should be done early if it is not available already. This is necessary to provide a safe working environment for the City personnel in the facility as well as the construction crews working on the Project. It is easier to plan for these issue when known and can be included in the scope. The impact on the budget and schedule can also be included during pre construction planing to avoid unexpected delays and costs at a later date. (Hunzinger)

Maintenance Plan

7. A Cyclical Maintenance Plan would reinforce WJE recommendation for continued maintenance on the building and is part of the scope of work for this project. Is it part of the peer review process? If so, is it complete and is it available? .(CMB)

8. Once this project is completed, a long term maintenance program of inspections and maintenance should be developed to prevent water infiltration and other detrimental sources of damage during the expected life cycle of the restoration Project. This can be developed with all the parties involved in the project and will help ensure the anticipated life of the current repair program be achieved. (Hunzinger)

Report Content and Organization

9. The proposed repairs, categorized by materials for the south tower versus the main building, are very detailed in the report. We recommend that the repairs are identified on elevation drawings, so the full scope of work for each element/component of the exterior facade is well understood. This approach will clarify how the repairs are related to each other, and whether the repair recommendations are comprehensive in scope. (SGH)

10. There appears to be a considerable amount of information in the Phase Two draft report. It is difficult to comment fully on the draft report without inspecting the building and/or seeing better quality photographs. (JGWA)

11. The existing format of the Phase Two report is awkward. The information in the report needs to be organized and then supplemented by additional information and analysis in the next phase of work. Within the existing report, the data, photographs, and drawings need to be integrated into the various sections to form a more coherent whole. Photographs and drawings, for example, should be integrated within each section. Master elevation drawings, with detail drawings and photographs keyed in, would be very useful. (JGWA)

12. The next phase of the project should include a historic structure report (HSR) for the exterior, consisting of a detailed history of the original construction and subsequent modifications. This information is essential in understanding why the current failures have occurred. The HSR should include a description of the exterior, noting where originally specified materials still exist, where substitutions were made during construction, and where subsequent replacements occurred. It should identify missing original/historic features and provide a process to determine whether they should be replaced or not. The history section should be footnoted and significant material included in the appendices. This information is essential in preparing comprehensive recommendations for the stabilization and restoration of the exterior of the City Hall. (JGWA)

13. Terms like "repair or restore as needed" should be avoided and specific recommendations should be made after additional investigations and research. (JGWA)

14. Some of the cross references from text to images are left blank. (CMB)

15. Need a "Glossary of Terms". Some terms are used interchangeably and meanings may be lost without valid description of term meaning relevant to this project. (CMB)

16. There is a lot of information within this study. Hopefully, a tour of the building will help to clarify some of the information and the rest will be the subject of discussion. It is difficult to give justice to this much work with a cursory review. (CMB)

17. Executive Summary - In regard to the Part 1 Study: Is it fully incorporated into the Part 2 study? If so, how? If not, is it available for review? (CMB)

18. Executive Summary - There was a "second opinion" completed in June of 2001. Is that opinion available? (CMB)

19. Executive Summary - Were the following completed as a segment of the Part 2 Study: flashing, stained glass, sealant compatibility test? (CMB)

20. Introduction - Page 2 – Brick – First and second sentences seem to contradict each other. There are some fairly comprehensive and extensive recommendations made which seem, also, to contradict the conditions. (Specific questions are raised under the Brick section) .(CMB)

21. (Specific questions are raised under the individual materials sections.) .(CMB)

22. Introduction - Phase One -- Methodology and Review - The extent of interior work described as Part 1 is "interior plaster, exposed clay tile and structural steel, and windows that show evidence of water penetration form the exterior". Is that the same for Part 2? .(CMB)

23. Phase Two - Methodology – Cleaning and Testing are mentioned as part of the Methodology. Is there a list and a description of the types of cleaning and the types of laboratory tests completed? .(CMB)

24. Phase Two - Methodology - Is there a comprehensive list of "typical categories of distress"? Or is this something that is addressed only as each material category is addressed? .(CMB)

25. History/Chronology of Construction - This section is very helpful. .(CMB) Of particular note:
    - Building was harshly cleaned – 1500 psi water pressure – WJE notes (later in the Study) that there is apparent damage from the prior cleaning method.
    - Building was coated with a clear acrylic resin sealer (1974). Consistent with observations by WJE (later in the Study), there is damage from this process as well. .(CMB)

26. History/Chronology of Construction - HABS documentation was instrumental in compiling the chronology of treatment for this building. It is recommended that WJE and the City of Milwaukee donate a synopsis of their final documentation to the HABS collection. .(CMB)

27. Materials – Recommendation Approach and Prioritization. Four categories for prioritization are recommended herein; the scope of work suggests five. The aesthetic issues are combined with "long term repairs" for the purposes of prioritizing. Is that to suggest that no appearance or aesthetic issues will be considered in the "near term repairs"? (CMB)

38. Page 18. There is an apparent typographical error that changes the meaning of the description–last paragraph under "Observations", second sentence. (CMB)

28. Roofing. Typo : Last paragraph, line four, "On" should be "one". (CMB)

29. Introduction - Page 2 - Brick–there are a couple of typographical errors that could change the meaning of the sentences.(CMB)

Constructability and Cost

1. Can the city utilize procurement methods other than conventional bidding, such as design/build, construction management, two-step negotiated procurement, or negotiated GC contract with competitively bid subcontracts? (JGWA)

2. Are there alternatives to using fixed scaffolding to access the entire building? (JGWA)

3. What are all the options for phasing the work by section of the building, trades (masonry, roofing), etc.? (JGWA)

4. Traditional competitive bidding is not necessarily the best system for the City to control cost, quality, and schedule. Other procurement methods should be carefully investigated. (JGWA)

5. Further discussion should be done regarding Life Safety as it relates to users of the building during construction. This affects egress and ingress, site usage, staging during construction. The requirements of the City of Milwaukee for Accessibility well as Emergency procedures should be considered. Security issues should be included especially in light of the heightened awareness due to the recent 9/11/01 attacks. Heightened security measure might be implemented for construction crews as well as possible access through temporary structures and enclosures. All of these issues have budgetary implications. (Hunzinger)

6. Should an investigation of the availability of Grants for historical restorations through the state or federal governments be done to determine if any funding is available? (Hunzinger)

7. MBE/WBE/DBE participation requirements should be considered for this project and how they may be achieved. (Hunzinger)

8. Other funding sources could be considered such as personalized charitable brick pavers ,etc. A "Blue Ribbon Panel" could be used to investigate various options. (Hunzinger)

9. The choice of traditional bid versus negotiated should be studied more closely. The long lead time required is a critical element when considering what type of contract to use. The impact of material measurement, shop drawings and manufacturing time is critical to maintaining budget and schedule. Access to the work is necessary to provide accurate information to manufacture specialized stone and terra cotta pieces. The winter weather will also impact schedule. Some work could be done in winter while others may not. The schedule could be compressed with either contracting method, but budget considerations may be affected. (Hunzinger)

10. Are sources for the stone, brick and terra cotta materials that provide a good match identified already? The Phase Two study stated 6 months is necessary for terra cotta deliveries. This should be done early in the pre construction process to avoid delays. Additional scaffolding could be installed on adjacent sides to provide terra cotta manufacturing to move ahead faster instead of an "on and off" schedule. This could lead to a smoother work flow as well as a shorter schedule. (Hunzinger)

11. Owner Direct purchases may be used to purchase the brick, stone, terra cotta and any other substantial materials to save the tax costs. Any material ordered could be stored off site until needed. (Hunzinger)

12. The scope of any testing is not discussed but is listed as a Budget Line Item as the "Design, contract documents, observations, testing line item at 10% of Overall Total." Is this enough to cover all testing required for the Project as well as "Design, contract documents, etc."? (Hunzinger)

13. There is no discussion of Insurance cost. There should be some discussion of the costs for Builders Risk, General Liability, Property Liability etc. and who will pay for them. There also is no mention of Performance and Payment bonds. These issue will have costs and will be a budget issue. (Hunzinger)

14. Details of the Scaffolding estimate would be helpful to analyze erection issues, maintenance costs, phasing and removal requirements. These costs are critical to determine whether it is cost effective to proceed consecutively on various sided or to wait during the winter season. Historically it is less expensive to proceed faster with more work progressing simultaneously, but the scaffold expense must compared to extended general conditions, inflation, maintenance, and wage increases. Budget may be the controlling factor relative to trying to accelerate this project. (Hunzinger)

15. Although the costs involved would be carried by the City of Milwaukee, it should be anticipated that some City employees might need to be relocated and / or rescheduled to accommodate the work. The impact of the work on the City employees should be planned into the schedule and budget. (Hunzinger)

16. Pertaining to the negotiated contract schedule, what is the purpose of a three-month gap between the study approval and the beginning of the preparation of the bid packages? (Krouse)

17. If a negotiated contract were to take place, it would be more advantageous for the city to purchase the terra cotta directly from the manufacturer. This way the terra cotta manufacturer can begin the survey and shop drawing phase much sooner allowing for better timing for the installer. With a project of this size and scope, the manufacturer will need at least 6 (six) months lead-time on the installation contractor. The months of September and October, in Milwaukee, would most likely provide better weather conditions for the terra cotta survey team and the sample removal by the contractor than to wait to begin this phase in November and December. If need be, the city could have a separate negotiated contract directly with the manufacturer and the sample removal contractor for only this initial phase to expedite these first steps. (Krouse)

18. The cost per unit of the terra cotta seems low. WJE indicated approximately $300.00 per unit, delivered. Given the size and style of the units, a per-unit cost of $500.00 is more realistic. (Krouse)

19. The negotiated contract schedule does not have a slot for setting up the tower scaffolding. When would that take place? (Krouse)

20. Under Appendix C, Cost Estimates for the Tower, Division 4-Masonry, B Terra Cotta, Item 10C states 'rebuild upper portions of gables'. How many terra cotta units are estimated as required for this area? My calculations, based on WJE's cost per unit, seem to imply 667 units. Is this the quantity you would agree is required for this area? (Krouse)

21. How will the contractors be prequalified if the city would like to proceed with a traditional bid contract? (Speweik)

22. Please clarify the basis of the escalation amount added to the estimate. (CRM)

23. Please provide a breakdown/calculation demonstrating the basis of the general conditions. (CRM)

24. Please provide a breakdown/calculation demonstrating the basis of overhead and profit addition. (CRM)

25. Please provide data supporting the scaffolding costs. (CRM)

26. Please clarify how much was included for the materials hoist (CRM).

27. Please confirm that the cost of an operator for the hoist has been included. (CRM)

28. Please confirm the costs include a sidewalk bridge to protect pedestrians in the vicinity. (CRM)

Section IV

JOHN G. WAITE, F.A.I.A.
Principal

Education

B.S., Building Sciences, Rensselaer Polytechnic Institute
B. Architecture, Rensselaer Polytechnic Institute
M.S., Architecture (Historic Preservation), Columbia University
William Kinne Fellows Memorial Traveling Fellowship (Historic Preservation and Restoration in 12 European countries)
International Museum Studies Program administered by International Council of Museums (UNESCO), and concerned with the installation of museum facilities in historic buildings, Europe

Professional Experience

Registered Architect - New York, New Jersey, Maryland, Massachusetts, Pennsylvania, Tennessee, Virginia, Vermont, Kentucky, District of Columbia, Georgia, NCARB Certificate
Partner - Liberty Street Restoration, 1997
Principal - John G. Waite Associates, Architects, 1995
Principal - Mesick·Cohen·Waite Architects, 1989-1995
Principal - Mendel·Mesick·Cohen·Waite·Hall Architects, 1984–1988
Principal - Mendel·Mesick·Cohen·Waite Architects, 1979–1984
Principal - Preservation/Design Group, 1976–1988
Visiting Lecturer, Cornell University School of Architecture, 1979 - Taught graduate course on the Conservation of Historic Buildings
Senior Historical Architect, New York State Division for Historic Preservation (New York State Historic Trust), Albany, NY, 1968–1975
Responsible for preservation and restoration work on the following New York State Historic Sites:
Schermerhorn Row Block (NYS Maritime Museum), New York City
Lloyd Manor House, Lloyd Harbor
Philipse Manor Hall, Yonkers
John Jay Homestead, Katonah
Knox Headquarters (John Ellison House), Vail's Gate
Washington's Headquarters (Jonathan Hasbrouck House), Newburgh
Senate House, Kingston
Ogden Mills Mansion, Staatsburgh
Clermont (Livingston Estate), Germantown
Olana (Frederic Church House), Hudson
Schuyler Mansion, Albany
Grant's Cottage, Mt. McGregor
Crown Point Barracks, Crown Point
Schoharie Crossing Canal Aqueduct and Store, Ft. Hunter
Johnson Hall, Johnstown
Herkimer Homestead (Gen. Nicholas Herkimer House), Herkimer
Hyde Hall, Springfield Center
Lorenzo (John Lincklaen House), Cazenovia
Parrott Hall, (New York State Agriculture Experiment Station), Geneva
Commandant's House & Lieutenant's House (Navy Yard), Sackett's Harbor
Union Hotel, Sackett's Harbor
Developed and administered a training program for restoration working on the State Historic Sites and supervised crew consisting of over 75 craftsmen

Responsible for the administration of the Capital Construction Budget for the New York State Historic Sites system

Responsible for the implementation and administration of the National Historic Preservation Act grant program in New York State including allocation of funding, architectural review and supervision, and coordination with the Department of the Interior for more than 150 projects.

Responsible for establishment and assisted in administration of compliance procedure in New York State with the Advisory Council on Historic Preservation under the National Historic Preservation Act of 1966.

Instructor and Research Associate, Columbia University School of Architecture Graduate Restoration and Preservation of Historic Architecture Program, 1967-1969.

Architectural Consultant, Ford Foundation, Fund for Area Planning and Development, New York City, 1966–1968

Assistant Architect and Architect, National Park Service, 1962-1966

Edison National Historic Site, West Orange, NJ

Historic American Buildings Survey Field Teams in Philadelphia, PA and Annapolis, MD

Supervisor, H.A.B.S. field team, Southport, CT

Architectural Researcher, "Architecture Worth Saving in Rensselaer County" and "Architecture Worth Saving in Albany," 1962–1965

Recent Preservation Projects

Blair House, The President's Guest House Complex, Washington, D.C.
Mount Vernon, Mount Vernon, VA
The Octagon, Washington, D.C.
Venetian Room, French Embassy, New York, NY
Homewood (The Johns Hopkins University), Baltimore, MD
Evergreen (The Johns Hopkins University), Baltimore, MD
The Pennsylvania Capitol, Harrisburg, PA
Jeffersonian Buildings, University of Virginia, Charlottesville, VA
Ontario County Courthouse, Canandaigua, NY
Old Barracks, Trenton, NJ
Tweed Courthouse, New York, NY
Saratoga Battle Monument (National Park Service), Schuylerville, NY
The University of Wisconsin Armory/Gymnasium ("Old Red Gym"), Madison, WI
Schenectady City Hall, Schenectady, NY
Harry S. Truman Library and Museum, Independence, MO
Greenwood Plantation (Georgia Trust for Historic Preservation), Thomasville, GA
Grace Church (P.E.), Millbrook, NY
Tennessee State Capitol, Nashville, TN
Lincoln Memorial, Washington, D.C.
New York City Bureau of Water Supply Dams, Westchester and Putnam Counties, NY
Governor's Office, New York State Capitol, Albany, NY
Yin Yu Tang, Peabody Essex Museum, Salem, MA
Farmers and Merchants Union Bank, Columbus, WI
Rensselaer County Courthouse, Troy, NY
Basilica of the Assumption (B. H. Latrobe), Baltimore, MD

Professional Activities

Member, U.S. General Services Administration's Public Buildings Service, National Register of Peer Professionals (Advisory Committee to Commission of Public Buildings)
Appointed Member - Committee on Historic Resources, American Institute of Architects
Board Member - National Preservation Institute
Member - Restoration Committee, Georgia Trust for Historic Preservation
Chairman - Washington County Covered Bridge Advisory Committee
Board Member and Chairman - Buildings and Structures Committee, NE-Rail (Northeastern New York Railroad), Washington County, NY
Founder and former Board Member - Society for Industrial Archeology
Former Board of Directors Member and Chairman of Training and Standards Committee - Association for Preservation Technology
Former Member - City of Troy, New York, Historic District and Landmarks Review Commission
Former Board Member - Rensselaer County Historical Society
Former Member - Board of Directors, Historic Albany Foundation

Publications

Books

"Deterioration and Methods of Preserving Metals." Metals In America's Historic Buildings: Uses and Preservation Treatments. 2nd rev. ed. Washington, D.C.: U.S. Department of the Interior, 1992.

"Deterioration and Restoration of Brickwork at The Octagon, Washington, D.C." NATO-CCMS Pilot Study Conservation of Brick Structures: Proceedings of the 6th Expert Meeting, Williamsburg, 28-31 October 1992. Berlin: Umwelthundesant, 1993.

"The Approach to Restoration at The Octagon." The American Architectural Foundation: Evolution of the Restoration Process. New Directions Symposiums, May 15, 1992, Washington, D.C. Washington, D.C.: American Architectural Foundation, 1993.

"The Octagon's Historic Structure Report and Master Plan." The American Architectural Foundation: Historic Structure Report Symposium, 25-26 February 1991, Washington, D.C. Washington, D.C.: American Architectural Foundation, 1993.

Preservation Brief 27: The Maintenance and Repair of Architectural Cast Iron. Washington, D.C.: U.S. Department of the Interior, National Park Service, 1991.

The Maintenance and Repair of Architectural Cast Iron: A Technical Preservation Brief. New York: New York Landmarks Conservancy, 1991.

Ontario County Court House: Its History and Restoration. Canandaigua, New York: County of Ontario, 1988.

"Architectural Metals: Their Deterioration and Stabilization." Preservation and Conservation Principles and Practices. Washington, D.C.: The National Trust for Historic Preservation and the Smithsonian Institution, 1976.

"The New York State Historic Preservation Program." Building Early America: Contributions Toward the History of a Great Industry. Radnor, Pa: Chilton Book Company, 1976.

The Architecture of Lansingburgh, New York. Lansingburgh: Lansingburgh Historical Society, 1976.

Industrial Archeology in Troy, Waterford, Cohoes, Green Island and Watervliet. Troy, New York: Hudson Mohawk Industrial Gateway, 1973.

Iron Architecture in New York City. Albany: New York State Historic Trust, 1972.

Published Reports

University of Virginia Comprehensive Historic Structure Report. Charlottesville: University of Virginia, 1987.

Pavilion I Historic Structure Report. Charlottesville: University of Virginia, 1987.

Pavilion II Historic Structure Report. Charlottesville: University of Virginia, 1992.

Pavilion V Historic Structure Report. Charlottesville: University of Virginia, 1994.

Pavilion VI Historic Structure Report. Charlottesville: University of Virginia, 1992.

Tweed Courthouse, New York City, Feasibility Study. 2 vols. New York: City of New York, 1991.

Historic Structure Report: United States Post Office, Court House and Custom House, Albany, New York. New York: General Services Administration, 1986.

Tennessee State Capitol Historic Structure Report, Nashville, Tennessee: State of Tennessee, 1986.

Historic Structure Report: United States Federal Office Building, 50 United Nations Plaza, San Francisco, California. San Francisco: General Services Administration, 1982.

Historic Structure Report: United States Custom House, San Francisco, California. San Francisco: General Services Administration, 1982.

Chenango County Courthouse: Norwich, New York: An Historic Structure Report in Four Parts. Norwich, New York: Chenango County Planning and Development Board, 1980.

"Division 10: Roofing." Technical Handbook for Historic Preservation. Washington, D.C.: U.S. Department of the Interior, Heritage Conservation and Recreation Service, 1980.

"Division 16: Metals and Metal Preservation." Technical Handbook for Historic Preservation. Washington, D.C.: U.S. Department of the Interior, Heritage Conservation and Recreation Service, 1980.

Hudson-Mohawk Urban Cultural Park Heritage Trail Summary Report. Albany: New York State Office of Parks and Recreation, 1979.

Fort Johnson: Amsterdam, New York: A Historic Structure Report. Washington, D.C.: U.S. Department of the Interior, 1978.

Grey Towers Historic Structure Report. Washington, D.C.: U.S. Department of Agriculture, Forest Service, 1978.

Schermerhorn Row Block Preliminary Historic Structure Report. Albany: New York State Office of Parks & Recreation, 1975.

Herkimer House Historic Structure Report. Albany: New York State Historic Trust, 1972.

John Jay House Historic Structure Report. Albany: New York State Historic Trust, 1972.

The Stabilization of an Eighteenth Century Plaster Ceiling at Philipse Manor. Albany: New York State Historic Trust, 1971.

Northwest Stonehouse, Johnson Hall, Historic Structure Report. Albany: New York State Historic Trust, 1971.

Senate House Historic Structure Report. Albany: New York State Historic Trust, 1971.

Washington's Headquarters, The Hasbrouck House, Historic Structure Report. Albany: New York State Historic Trust, 1971.

A Compilation of Historical and Architectural Data on the New York State Maritime Museum Block in New York City. Albany: New York State Historic Trust, 1969.

Articles

Book Review: Kay, Gersil Newmark. Mechanical & Electrical Systems for Historic Buildings Applied Mechanics in Reviews: The American Society of Mechanical Engineers, Vol. 46, No. 6 (June 1993).

"Homework: Caring for Decorative Metalwork." Historic Preservation, Vol. 38, No. 6 (November/December, 1986).

"Tinplate & Terneplate Roofing: Preservation and Repair." The Old-House Journal, Vol. IX, No. 3 (March 1981).

"How To of Preservation," American Preservation, Vol. 1, No. 1, (October/November 1977).

"Stovemakers of Troy, New York." The Magazine Antiques, Vol. CIII, No. 1 (January, 1973).

"Stillwater, New York, House Specifications, 1843," Journal of the Society of Architectural Historians, XXVI (March, 1966).

Awards

American Institute of Architects College of Fellows Award
1996
Awarded to John G. Waite, FAIA for notable contributions to the advancement of the architecture profession.

Association for Preservation Technology Harley J. McKee Award for Outstanding Contributions to the Field of Preservation Technology
1995
Awarded to John G. Waite, AIA.

American Institute of Architects Institute Honors Award
1995
Awarded to the University of Virginia for distinguished achievement for the preservation of the Academical Village, Charlottesville, Virginia.

Masonry Institute, Inc., Masonry Design Award
1995

Art Commission of the City of New York Excellence in Design Award
1995
Restoration of Cross River Dam, Katonah, New York.

Historic Massachusetts, Inc., Anne and Roger Webb Award for the Outstanding Example of Adaptive Use and Rehabilitation of a Historic Structure in the Commonwealth
1992
Restoration and Rehabilitation of the Clock Tower Complex (Eagle Office and Technology Park), Pittsfield, Massachusetts.

Municipal Arts Society Civic Design Award
1992
Exterior restoration of Tweed Courthouse, New York, New York.

Preservation League of New York State Public Trust Award
1989
Restoration of Ontario County Courthouse, Canandaigua, New York.

City of Schenectady, New York, Certificate of Appreciation for the Restoration of Schenectady City Hall
1986
Restoration of Schenectady City Hall, Schenectady, New York.

Preservation League of New York State Historic Civic Building Award
1985
Restoration of Chenango County Courthouse, Norwich, New York.

Preservation League of New York State Historic Civic Buildings Award
1985
Restoration of Otsego County Courthouse, Cooperstown, New York.

Preservation League of New York State Historic Civic Buildings Award
1985
Restoration of Schenectady City Hall, Schenectady, New York.

U.S. Department of Transportation/National Endowment for the Arts Commendation for Design Excellence
1981
Hudson-Mohawk Urban Cultural Park Heritage Trail Design, Troy, New York.

Building Stone Institute Tucker Award for Architectural Excellence
1981
Exterior restoration of Joseph Papp New York Shakespeare Festival Public Theater, New York, New York.

Brent Gabby, P.E.

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Simpson Gumpertz & Heger Inc.
Consulting Engineers
Boston / San Francisco / Washington, DC

Education

University of Texas at Austin, College of Engineering:
B.S. in Architectural Engineering (Structures Option), 1986
University of Texas at Arlington, Graduate School of Architecture, 1991-1992
University of York (England):
M.A. in Conservation Studies (Buildings Option), Institute of Advanced Architectural Studies, 1994
M.A. in Archaeology, Department of Archaeology, 1995

Experience

Simpson Gumpertz & Heger Inc. from 1995 to present.

1988 – 1991: Staff Engineer in the Engineering and Research Division of Brick Institute of America (BIA). Responsibilities included giving technical assistance to design professionals, closely monitoring and managing BIA sponsored research, writing and revising issues of *Technical Notes on Brick Construction* and *Engineering and Research Digest*, writing technical articles and papers for publication, giving seminars to design professionals, contractors and building inspectors, teaching BIA sponsored classes on brick construction and design, and inspecting building failures throughout the country due to man-made and natural causes.

1986 – 1988: Engineer for 2618 Broadway Restoration Company, Galveston, TX. Responsibilities included managing and implementing structural repairs to the Willis-Moody Mansion (circa 1893). Other job responsibilities included producing as-built and measured drawings and scheduling stone replacement for the mansion.

Investigation

Investigation of building envelopes involving masonry walls, windows, and roofs. Field and laboratory testing to evaluate structural, leakage and material problems.

Historic Buildings

- Walter Gropius House (National Historic Landmark - circa 1938), Lincoln, MA (leakage of windows and built-up roofing)
- Wakefield Place (circa 1890), Gardner, MA (window leakage and masonry deterioration)
- Beverly Public Library (circa 1913), Beverly, MA (condition assessment of brick masonry, marble and clay masonry half-dome)
- Harrison Gray Otis House (National Register of Historic Places – circa 1796), Boston, MA (condition assessment and laboratory analysis of slate roof)
- The Chapel (circa 1850), Bowdoin College, Brunswick, ME (condition assessment of granite bell towers)
- Odd Fellows Building (National Register of Historic Places – circa 1895), Wakefield, MA (masonry repair after catastrophic fire)
- Old Essex Hotel (National Register of Historic Places – circa 1899), Boston, MA (condition assessment of steel frame and masonry walls)
- The Ritz-Carlton (circa 1926), Boston, MA (condition assessment of steel frame and masonry walls)
- Harry Elkins Widener Library (circa 1912), Harvard University, Cambridge, MA (condition assessment of exterior brick and limestone)

- 50 Commonwealth Avenue (circa 1920), Boston, MA (window leakage and condition assessment of brick and cast stone walls)
- Pine Street Inn (circa 1880), Boston, MA (condition assessment of brick tower and masonry walls)
- Robbins Memorial Flagstaff (circa 1913), Arlington, MA (condition assessment of wood flagpole and marble sculpture)
- Baker House Dormitory (circa 1948), MIT, Cambridge, MA (peer review of window selection)
- Building 33 (circa 1927), MIT, Cambridge, MA (condition assessment of brick walls and steel frame)
- Emory House (circa 1750), West Newbury, MA (condition assessment of original structure and new adjoining buildings)
- Charlesgate Building (circa 1880), Boston, MA (condition assessment of masonry walls, decorative copper, window leakage, and roofing)
- Fenway Studios (circa 1911), Boston, MA (condition assessment of brick masonry and steel framing)
- Wadsworth Athenaeum (National Register of Historic Places - 1850-1969), Hartford, CT (foundation waterproofing and building envelope consulting)
- Proctor Estate (circa 1911), Ipswich, MA (condition assessment of brick and stone walls, and clay tile roofing)
- Spencer Peirce Little House (National Register of Historic Places - circa 1690), Newburyport, MA (water testing, leakage survey, repair recommendations)
- Boston Athenaeum (National Register of Historic Places - circa 1884), Boston, MA (water testing, conditions assessment of masonry walls and structural framing, repair recommendations)
- Vermont Building (circa 1904), Boston, MA (water testing, conditions assessment of masonry walls, repair recommendations)
- Peterborough Museum (circa 1916), Peterborough NH (clay tile roof investigation, repair recommendations)
- Sherman Burbank Memorial Chapel (circa 1938), Williamstown MA (condition assessment of slate roof, masonry walls and bell tower, repair recommendations)
- Lincoln Library (circa 1884), Lincoln, MA (condition assessment of slate roof, masonry walls and clock tower, repair recommendations)
- Brimfield Study Centre (circa 1900), Newton MA (conditions assessment of slate roof, wood framing, repair recommendations)
- St. Mary's of the Immaculate Conception (circa 1890) Pawtucket, RI (conditions assessment of slate roof and masonry walls, repair recommendations)
- St. John the Divine Monastery (circa 1936) Cambridge MA, (conditions assessment of slate roof and masonry walls, repair recommendations)
- First Church Cambridge (circa 1870), Cambridge, MA (condition assessment of sandstone bell tower)
- G. Fox Building (National Register of Historic Places – circa 1917) (condition assessment of brick, terra-cotta and windows)
- Landmark Building (circa 1930), Boston, MA (pre-purchase survey of brick, windows, clay tile and membrane roofing)
- St. James Place (circa 1927), Boston, MA (condition assessment of limestone facade and windows)
- Old Suffolk County Courthouse, (circa 1909), Boston, MA (condition assessment of granite facade, windows, and slate and membrane roofing systems)

Contemporary Masonry

- Chelsea High School, Chelsea, MA (performance of mortar using an in-situ bond wrench)
- Bay State Medical Center, Springfield, MA (masonry parapet failure)
- 3900 North Charles, Baltimore, MD (brick masonry spalling and failure)
- One and 101 Main Street, Cambridge, MA (pre-purchase survey of brick masonry curtain wall and strip windows)
- Emery House, West Newbury, MA (leakage investigation)

EIFS

- DoubleTree/Guest Suites Hotel, Rocky Point, Tampa FL (leakage of windows, EIFS and curtain wall)

Masonry Pavements

- Pratt Street, Hartford, CT (clay paver deterioration)

Design

Design of remedial roofing, masonry and window repairs; writing specifications; construction cost estimating; preparation of construction documents.

- Gropius House, Lincoln, MA (window flashing, and window and built-up roof replacement)
- Sherman Burbank Memorial Chapel, Williamstown MA (slate roof, copper flashing and roof, structural stabilization of bell tower)
- Brimfield Study Centre, Newton MA (slate roof, copper flashing and roof, wood frame repairs)
- Ritz-Carlton, Boston, MA (total masonry facade replacement and structural repairs to steel frame and walls)
- Sterling Law School, Yale University, New Haven, CT (built-up roof and masonry flashing details)
- Harrison Gray Otis House, Boston, MA (slate roof and copper flashing and gutter details)
- One Prudential Plaza, Chicago, IL (remedial anchor design for limestone veneer panels)
- Odd Fellows Building, Wakefield, MA (brick masonry and flashing)
- 68 Beacon Street, Boston, MA (brick masonry repair and steel frame reinforcement)
- Robbins Memorial Flagstaff, Arlington, MA (re-design of the original flagstaff)
- Building 33, MIT, Cambridge, MA (masonry stabilization, window reinforcement, and aluminum overcladding system)
- Memorial Hall, Bowdoin College, Brunswick, MA (expansion joint design between a new and existing structure)
- Emery House, West Newbury, MA (window flashing, window replacement, brick veneer replacement, shingle roof replacement, and brick masonry retaining wall design)
- 50 Commonwealth Avenue, Boston, MA (cast stone replacement)

Special Access

Industrial Rope Access:

- Wall and Window Survey, Boston Athenaeum, Boston, MA (225 ft elevation)
- Wall Survey, Pine Street Inn, Boston, MA (150 ft elevation)
- Wall Survey, 695 Atlantic Avenue, Boston, MA (150 ft elevation)
- Wall and Window Survey, G. Fox Building, Hartford, CT (275 ft elevation)
- Wall and Window Survey, Wadsworth Atheneum, Hartford, CT (75 ft elevation)
- Wall and Window Survey, St. James Place, Boston, MA (150 ft elevation)
- Wall and Window Survey, Landmark Building, Boston, MA (150 ft elevation)
- Wall and Window Survey, One and 101 Main Street, Cambridge, MA (200 ft elevation)
- Wall and Window Survey, Old Suffolk County Courthouse, Boston, MA (150 ft elevation)

Research and Development

- Laboratory research and development of axial stress and deformability determination in masonry walls using the flat-jack technique.

Registration

Professional Engineer (Structural): Massachusetts

Lectures

Gabby, B., Cash, K.B., "Building Facade Construction Practices for the Late 19th Century to the Middle 20th Century: History, Investigation, and Repair," Restoration & Renovation, Hilton & Towers, Washington, DC, 14 January 2001.

Gabby, B., "Overview of the 20th Century Masonry Construction Practices: History, Codes, and Context" and "Investigation and Diagnosis of Transitional Masonry Facade Problems," Late 19th/Early 20th Century Masonry Buildings: Evaluation through Remediation, The Palmer House Hilton, Chicago, IL, 10 and 11 May 2001.

Gabby, B., "Conservation of Gropius House," *Society for the Preservation of New England Antiquities,* Lincoln, MA, Oct. 2000.

Gabby, B., Cash, K.B., Vossoughi, H, and Bronski, M.B., "Building Facade Construction Practices from the Late 19th to the Mid 20th Century: History, Investigation, and Repair," *Restoration and Renovation 2000,* Boston, Feb. 2000.

Gabby, B., "Conservation of Gropius House," *Winds of Change,* Association for Preservation Technology, Banff, Canada, Oct. 1999.

Gabby, B., "Conservation of Gropius House," *Society for the Preservation of New England Antiquities,* Lincoln, MA, Oct. 1999.

Bell, G.R., and Gabby, B., "In situ Evaluation of Compressed Veneer Using the Flat-Jack Technique," *Masonry Materials, Testing, and Applications*, ASTM STP 1356, Nashville, TN, Dec. 1998

Grimm, C.T., and Gabby, B., "U.S. Brick Econometrics: 1930-1992," *Masonry Materials, Testing, and Applications*, ASTM STP 1356, Nashville, TN, Dec. 1998

Gabby, B., "Non-destructive Evaluation Techniques," *Build Boston,* Nov. 1998.

Gabby, B., "Conservation of Gropius House," *Build Boston,* Nov. 1998.

Gabby, B., and Rutila, D.A., "Masonry Prevention Maintenance," panel discussion, Community Associations Institute – New England Chapter, Oct. 1998.

Bronski, M.B., and Gabby, B., "A Comparison of Principles in Several Architectural Conservation Standards," *International Symposium on the Use and Need for Preservation Standards in Architectural Conservation,* ASTM STP 1355, Atlanta, GA, Apr. 1998.

Gabby, B., "Aluminum and Other Modern Metals, The Built Environment: Bringing the Past into the 21st Century – Policy Materials, & Systems," Boston, MA, Nov. 1997.

Professional Activities

The Masonry Society: Member
Association for Preservation Technology: Member
International Council on Monuments and Sites: Member

Honors and Awards

Overseas Student Scholarship (Awarded by University of York)

Publications

Louis, M.J., and Gabby, B. "Option Analysis of Replacement Windows: A Case Study," *Construction Specifier*, Aug. 2000

Gabby, B., "Understanding & Evaluating Transitional Masonry Facades," *Construction Specifier*, May 2000

Gabby, B., "How Full Is Full?" *Magazine of Masonry Construction*, Aug. 1999.

Bell, G.R., and Gabby, B., "In situ Evaluation of Compressed Veneer Using the Flat-Jack Technique," *Masonry Materials, Testing, and Applications*, ASTM STP 1356, Nashville, TN, Dec. 1998

Grimm, C.T., and Gabby, B., "U.S. Brick Econometrics: 1930-1992," *Masonry Materials, Testing, and Applications*, ASTM STP 1356, Nashville, TN, Dec. 1998

Bronski, M.B., and Gabby, B., "A Comparison of Principles in Several Architectural Conservation Standards," *International Symposium on the Use and Need for Preservation Standards in Architectural Conservation*, ASTM STP 1355, Atlanta, GA, Apr. 1998.

Adler, D.L., Cash, K.B., and Gabby, B., "A Chip Off the Old Slate," interview by M.J. Crosbie, Ph.D., *The Construction Specifier*, Nov. 1997.

Gabby, B., and Borchelt, J.G., "How to Place Grout," *Magazine of Masonry Construction*, June 1991.

Gabby, B., Borchelt, J.G., Nunn, M., and Trimble, B., *Brick Masonry Noise Barrier Walls – Introduction*, Technical Notes on Brick Construction 45, Brick Institute of America, Feb. 1991.

Gabby, B., "Specifying Brick Pavers," *The Construction Specifier*, Jan. 1991.

Borchelt, J.G., MacDonald, H., Trimble, B, Gabby, B., and Nunn, M., *Pocket Guide on Brick Construction*, Brick Institute of America, 1991.

Gabby, B., "About Face," *Architecture*, Apr. 1990.

Borchelt, J.G., Brown, M., Gabby, B., Trimble, B., MacDonald, H., and Nunn, M., *Principles of Brick Masonry*, Brick Institute of America, 1990.

Gabby, B., "A Compilation of Flexural Bond Stresses for Solid and Hollow Non-Reinforced Clay Masonry and Portland Cement-Lime Mortars," *Masonry: Components to Assemblage*, ASTM STP 1063, 1990.

Gabby, B., "Cold Weather Construction Techniques," *BIA News*, Dec. 1989.

Gabby, B., "Understanding the ASTM Paver Specification: A Salesperson's Guide," *BIA News*, Oct. 1989.

Gabby, B., "Understanding the ASTM Brick Specification: A Salesperson's Guide, Part 2," *BIA News*, Aug. 1989.

Gabby, B., "Understanding the ASTM Brick Specification: A Salesperson's Guide, Part 1," *BIA News*, July 1989.

BG (09/01)

ELIZABETH CORBIN MURPHY, AIA
HISTORIC PRESERVATION SPECIALIST, ARCHITECT

Master of Architecture 1985	Kent State University--Preservation of Built Environment
Bachelor of Architecture 1978	University of Notre Dame
Adjunct Professor (Graduate Status)	Kent State University--Architecture & Environmental Design
REGISTRATION:	Registered Architect Ohio, Michigan, NCARB Certified Interior Designer NCIDQ
PROFESSIONAL AFFILIATIONS:	American Institute of Architects Vice Chair, National Advisory Group, AIA Historic Resources Comm. Design Awards Jury, AIA Washington DC Year 2001 Octagon Committee, Chair, 2001 Am Architectural Foundation Bd of Regents -- Octagon Rep. 2001 Design Awards Jury, National AIA Honor Awards year 2000 Charles E. Peterson Prize (HABS), National Jury 1999 National Advisory Bd, "Restoration/Renovation 2000"conference AIA Contracts, Advisor to Natl Comm for B204(2000) Preservation AIA Ohio Conf. 2000 Committee–Continuing Education Chair Association for Preservation Technology Am Institute for Conservation of Historic & Artistic Works AIA Akron -- President 1991; Exec Board 1985-1992 1994 Ohio Arts Council--Design Arts Panel 1988-1990, 1993-1995 Ohio Public Works Advisory Committee
SIGNIFICANT PROJECTS: representative listing	Octagon Museum–Assess Appropriate Use, Natl Historic Landmark Fair Lane, The Henry Ford Estate–Cyclical Maintenance & HABS OH Dept of Agriculture Serum Bldg–Rehab to Enforcement Office OH Courts Bldg–Tech Restoration Mosaics/Bronze (w/SCA) Western College for Women (Peabody Hall)–$6 mil rehabilitation Edsel & Eleanor Ford House–Cyclical Maintenance Planning/Rest. Rutherford B. Hayes Presidential Home – HABS Drawings School of Fashion Design KSU– Cleve Int Design Award (w/Myers) Ohio & Erie Canal Natl Heritage Corridor Management Plan (w/Icon) The Huston Brick–National Road Hist Building "museum quality restoration"
LECTURES/PUBLICATIONS representative listing	*Nat'l Historic Treasures Restored & Preserved,* AIA Cleveland 2001 *Historic Structures Reports*, Workshop/AIA Natl Convention 2000 *Cyclical Maintenance Versus Deferred...*, AIA Natl Convention 2000 *Preparing a Winning Awards Submittal*, AIA Ohio Conference 2000 *Technical Session on Maintenance*, Williamsburg APT 30th Ann Conf *Cyclical Maintenance Planning*, AIA Ohio Annual conference *Restoring Historic Educational Facilities*, AIA Hist Resources Comm *"What It Feels Like to Be a Building"*, U Akron, Women's Hist Month *Exploring Historic Structures*, KSU School of Architecture *Understanding Architecture*, KSU School of Architecture "Painting a Surprising Picture of the Past"The Cleveland Plain Dealer

HONORS & AWARDS: representative listing	Design Award, AIA Ohio Saint Mary Church (w/Myers Assoc) Cleveland Interior Design Award Saint Mary Church (w/Myers Assoc) HABS, C. E. Peterson Prize, 2001 Second Prize Nat'l (Directed Team) HABS, C. E. Peterson Prize, 2000 & 1996 First Prize (Directed Team) HABS, C. E. Peterson Prize, 1998 Honorable Mention (Dir. Team) HABS, C. E. Peterson Prize, 1984 Honorable Mention National Design Award, AIA Akron Ohio & Erie Canal National Heritage Corridor Management Plan (w/Icon Architecture) Design Award, AIA Ohio Medina Cty Achievement Center (w/Myers) Design Award, AIA Akron Stow Safety Center (w/Myers Assc) Design Award, AIA Ohio School of Fashion Design (w/Myers Assc) Technical Merit Award for Preservation, AIA Akron Architectural Heritage Award, Summit Co Historical Society Women in Science, Mathematics & Engineering -- Exemplar, Ohio Academy of Science
COMMUNITY SERVICE & COMMUNITY ORGANIZATIONS:	Summit County Planning Commission Cleveland Restoration Society Summit County Historical Society Ohio Preservation Alliance Progress Through Preservation Boy Scouts of America, Ohio Troop 96, Merit Badge Counselor: Architecture, Scholarship, Communications, Citizenship in the World

Elizabeth Corbin Murphy is a principal member of Chambers, Murphy, & Burge, Restoration Architects a Small Business and a Women-Owned Business Enterprise.

Her expertise extends from schematic design to construction documents from field supervision, to peer review. Ms. Murphy has directly related experience as both a **Project Manager** and a **Restoration Architect**. Ms. Murphy has extensive experience in planning and programming. **Cyclical Maintenance Plans** (and their implementation!) are a special focus. Maintenance Plans have been implemented for the Edsel & Eleanor Ford House and Fair Lane (the Henry Ford Estate). Ms. Murphy is Chair of the Octagon Committee, advisory to the Octagon (House Museum and Museum of Architecture and Design) and to the Board of the American Architectural Foundation.

Ms. Murphy's knowledge of restoration standards and principles is demonstrated by her Master of Architecture Thesis "Conservation, Restoration, Extended and Adaptive Use: The Significance of Recycling Buildings with Respect for Architecture of the Past and Consideration for Present and Future Use", which studied the impact of the Secretary of the Interiors Standard for Rehabilitation. The inventory of 20 buildings and subsequent seven case studies evaluated consisted of already completed renovation projects involving National Register of Historic Places properties and the employment of Federal Government financial assistance.

CRM

SIMON M. DVORETSKY

Education:

Belorussian Engineering Institute, Gomel, Belorussia 1969

Professional Qualifications/Registrations:

MS Civil and Construction Engineering 1969

Member American Association of Cost Engineers

Background and Experience:

Mr. Dvoretsky has over 34 years of experience in the field of construction consultancy including cost estimating through all stages of design, cost control and cost containment, value engineering, and construction period evaluation services on projects both in the United States and overseas.

During a ten-year period as the chief estimator for a Cincinnati, Ohio based General Contractor he was responsible for hard bid, design and build proposals, cost control systems and project management on a wide variety of commercial, medical and institutional construction projects.

He has provided cost control and construction consultancy services on a diverse range of projects. These include hospitals, laboratories, hotels, offices, railroads, airports, highways, bridges, industrial and residential developments, waste water treatment plants, retail malls, museums, embassies, courthouses and correctional, educational, civic, cultural, religious and military facilities. The work covers renovation, remodeling and new build. The total value of these projects runs into many hundreds of millions of dollars and covers a wide cost range from the small residential restoration to multi million dollar commercial and public sector developments.

Mr. Dvoretsky is a co-founder and a Partner of *Construction Resources and Management*. His primary responsibilities include construction cost estimating and cost control services.

CRM

SIMON M. DVORETSKY

Representative Experience, Renovation/Restoration Projects:

- Renovations to House and Senate Chamber, State Capitol, Springfield, IL
- Fine Arts Building Restoration, Ball State University, Muncie, IN
- Pullman State Historic Site restoration, Chicago, IL
- Roosevelt University, Gage Building Renovation, Chicago, IL
- Restoration Hotel Florence, Chicago, IL
- Renovation of Lobby, USRRRB Federal Building, Chicago, IL
- Auditorium Building Conservation Masterplan, Chicago, IL
- Children's Museum expansion and renovation, Indianapolis, IN
- Eiteljorg Museum Expansion, Indianapolis, IN
- Indianapolis Museum of Art expansion, Indianapolis, IN
- McCormick Place Garage Repairs, Chicago, IL
- Exterior Repairs, Richardson Towers, Memphis, TN
- Exterior Repairs, One Union National Plaza, Little Rock, AR
- Plaza and Roof Repairs, 140 Broadway, New York, NY
- Façade Repairs, Eastern Illinois University, IL
- Exterior Renovation, Pickwick Place, Glen Ellyn, IL
- Replacement of Curtain Wall, 1000 N. Lake Shore Drive, Chicago, IL
- Façade and Balcony Repairs, 3440 N. Lake Shore Drive, Chicago, IL
- Roof Repairs, Thompson Center, Chicago, IL

CRM

SIMON M. DVORETSKY

Representative Experience, Renovation/Restoration Projects (continued):

- Grace Church, Memphis, TN
- Exterior repairs, Time Life Building
- Renovation, US Customs House, Chicago, IL
- Façade and roof repairs, CHA Jackson Park, Chicago, IL
- Parapet repairs, Sentry Insurance Building
- Lobby Renovations, US Post Office, 211 S. Clark St. Chicago, IL
- Miller Brewery Visitor Center, Milwaukee, WI
- Repairs Transamerica Tower
- Renovations Kennedy Center for the Performing Arts, Washington

Curriculum Vitae
John Speweik

EDUCATION:

Certificate in Masonry Design and Engineering, University of Toledo, Northwest Ohio Masonry Institute, Toledo, Ohio 1987

Certificate in Masonry Maintenance and Restoration, University of Toledo, Northwest Ohio Masonry Institute, Toledo, Ohio 1988

ASSOCIATIONS:

Member ASTM Committee C-12, Mortar for Unit Masonry 1992
Member Construction Specifications Institute 1993
Member Building Limes Forum - England 1995
Member ICCROM Masonry Training Committee 1996
Member Association of Preservation Technology (APT) 1994

EXPERIENCE:

1997 to date--Historic Masonry Specialist, Founder and Vice President of U.S. Heritage Group Inc., Chicago. Emphasis: management, product development, organize, design and implement hands on training program. Established national sales and marketing strategy.

1992 to 1997--Product Manager for GenLime Group - Genoa, Ohio.
Emphasis: Management of sales and distribution of products in the United States, Canada and the Caribbean Islands. Established new products and developed sales and marketing programs.

1988 to 1991--Territory Manager for Robinson Brick Company - Denver, Colorado.
Emphasis: Sales and distribution of product in six state territory. Developed and implemented a national sales strategy.

TRAINING:

Developed training program to teach American masons European masonry restoration materials and skills during the "European Historic Masonry Study Tour" in London, England, September 2000.

Senior instructor for the U.S. Heritage Group's "Repointing Historic Masonry Workshops". Training architects, masons, National Park Service (NPS) staff and historic preservation officers nationwide, Chicago, Illinois, April 1998 to present. A list of students is available at: www.usheritage.com.

Trained stone masons and architects in traditional repointing, whitewashing and rendering techniques during the annual gathering of the Building Limes Forum, Newry, Northern Ireland, September 1998.

Trained historic preservation architects and masons in traditional masonry repointing techniques while working on battlefield properties, Gettysburg, Pennsylvania, November 1998.

Trained masons and the Architect of the Capitol (AOC) staff in traditional masonry materials and repointing techniques at the U.S. Capitol, Washington D.C., July 1997.

John Speweik

PROJECTS:

Matched mortar and consulted on the masonry restoration of the following projects in the United States and Canada:

- U.S. Capitol - 1793, Washington, D.C.
- Parliament Hill - 1863, Ottawa, Canada
- Water Tower Place - 1867, Chicago, IL
- University of Notre Dame, gold dome - 1879, South Bend, IN
- Union Station - 1888, Indianapolis, IN
- Stan Hywet Hall & Gardens - 1905, Akron, OH
- Nebraska State Capitol - 1923, Lincoln, NE
- Georgia State Capitol – 1884, Atlanta, GA
- The Cathedral of St. Paul - 1907, St. Paul, MN
- Robie House, Frank Lloyd Wright – 1909, Chicago, IL

PUBLICATIONS:

Editor, *Traditional Masonry*, U.S. Heritage Group, Inc., Chicago

"Limewash Returns" *Period Homes Magazine*, (Summer 2000), pp. 33-34.

Preservation Briefs 2: Repointing Mortar Joints in Historic Masonry Buildings. U.S. Department of the Interior, National Park Service, Washington, D.C., 1998.

"Repointing Right: Why Using Modern Mortar Can Damage a Historic House." *Old House Journal*. Vol. XXV, No.4 (July-August 1997), pp.46-51.

"Repointing Historic Masonry Buildings to Last." *Masonry Magazine* ISSN 0025-4681 (September-October 1997), pp.20-26.

"Historic Lime Putty Mortar Returns to the Trowel." *Traditional Building*, ISSN 0898-0284 Vol. 9, No.4 (July-August 1996), pp.18-19.

"Lime's Role in Mortar." *Aberdeen's Magazine of Masonry Construction.* Vol. 4, No.8 (August 1996), pp.364-368.

The History of Masonry Mortar in America 1720-1995. National Lime Association, Arlington, VA, 1995. *Recipient of the National Technical Commendation Award, Construction Specifications Institute, Denver, June 1996.*

LECTURES:

Kansas State Preservation Conference, Preserving the Architectural Heritage of Kansas, "The Do's and Don'ts of Historic Masonry Repairs: The Lime Mortar Revival," Wichita, Kansas, April 2001.

Home & Garden Television (HGTV), "Just Ask Jon Eakes," Guest Appearance, Demonstrated historic limewashing techniques, Toronto, Canada, March 2001.

Restoration & Renovation Show – The Do's and Don'ts of Repointing Using Historic Lime Putty Mortar, Washington DC, January 2001.

ASTM - International Symposium - Matching Historic Mortar...The Construction Site Variables, Atlanta, Georgia, April 1998.

International Preservation Trades Workshop (IPTW) Hands-on Repointing Workshop, Frederick, Maryland, November 1997.

BOSTON VALLEY TERRA COTTA

John B. Krouse

516 Prospect Avenue
East Aurora, NY 14052
716-649-7490 (W) 716-655-1731

Summary of qualifications

Boston Valley Terra Cotta 1984 - Present
Orchard Park, New York

President, General Manager. Responsible for directing all plant activities. Active participation in all sales and contract negotiations. Involved in site surveys, project documentation and production implementation.

Education

Alfred University 1980-1984
Alfred, New York
BS Ceramic Engineering, Deans List.
University of Wisconsin at Madison

Masonry Design and Construction, Engineering Professional Development

Professional experience

Glaze chemist, two years, Model/Mold Engineer/Designer, six years, General Manager, ten years. Experienced in plant layout and design, combustion engineering and furnace design.

Additional professional activities

Research and Development of Architectural Terra Cotta clay bodies and glazes Ceramic Engineering Consulting

Professional Memberships

American Preservation Technology American Ceramic Society Construction Specifier Institute American Standards Testing Methodology International Masonry Institute

Accreditations

International Masonry Institute, Bricklayers and Allied Craftsmen, Instructor/Trainer

Awards received

Historic Preservation Commendation, State of Pennsylvania, Queen Lane Pumping Station Landmarks Preservation Commission, State of New York, Frederick F. French Building, NYC
Lucy G. Moses Award + NY Construction News Award for Queensboro Bridge Project, Univ. Plaza Albany Best Historic Restoration, Masonry Construciton 2001.

Hobbies

Neon glass bending, art ceramics and sculpture, stamp collecting, furniture refinishing, basketball, golf and tennis

HUNZINGER CONSTRUCTION COMPANY ◆ 11100 ENTERPRISE AVENUE ◆ BROOKFIELD, WI ◆ TEL 262.797.0700 ◆ FAX 262.797.0701 ◆ WWW.HUNZINGER.COM

JOEL BECKER, P.E.
VICE PRESIDENT - FIELD OPERATIONS/SAFETY

PROFESSIONAL EXPERIENCE

1987-Present Joel is in charge of all Hunzinger field operations. Responsibilities include: Directing safety program, quality control program, and lending support and advice to all field superintendents and foremen. Works with project managers to help coordinate field personnel.

1976-1987 Project Superintendent and Field Engineer.

EDUCATION

Bachelor of Science - Civil Engineering
Milwaukee School of Engineering, 1976 (Graduated Magna Cum Laude)
Time Mastery - Hunzinger Construction University

PROFESSIONAL AFFILIATIONS:

National AGC Safety Council - 1997.

AGC of Greater Milwaukee Chairman of the Milwaukee Construction Industry Safety Council - 1995 to present.

PROFESSIONAL ACCOLADES:

AGC of Greater Milwaukee Awarded "Committee Chairman Of The Year" - 1997, as head of the AGC Safety Committee.

AGC of Greater Milwaukee Awarded "Harvey Peterson Award" For His Many Years As A Member Of The AGC Safety Committee And For His Dedication To The Promotion Of Accident Prevention - 1995.

REPRESENTATIVE PROJECTS:

- **Pabst Theater Restoration;** Milwaukee, WI, restoration of historic theater, including elevator retrofit, terrace addition, gallery seating and underpinning of building's east wall, $7.9 Million.
- **St. Josaphat Basilica Renovation;** Milwaukee, WI, Extensive renovation of an 1896 land mark, $7 Million.
- **Grand Geneva Spa & Resort Renovation;** Lake Geneva, WI, extensive renovation of the Playboy Club resort, $30 Million.
- **Harley-Davidson Motor Company;** Wauwatosa, WI, Capitol Drive facility manufacturing and office addition, remodeling various projects.
- **Midwest Express Airlines Renovation at Mitchell International;** Milwaukee, WI, renovation project in the lower level of Concourse D, $1.1 Million.

JOEL BECKER, P.E.
(continued)

- **Signature Flight**; Milwaukee, WI, addition and renovations to passenger handling facility at Mitchell International Airport, $1.4 Million.
- **Harley-Davidson Product Development Center**; Wauwatosa, WI, 200,000 sf office, engineering labs, styling and research center.
- **Harley-Davidson Parts and Accessories Distribution Center**; Franklin, WI, 250,000 sf.
- **Midwest Express Center**; Milwaukee, WI, new 2-story convention facility including a 200,000 GSF exhibition hall, 30,000 GSF ball room, 40,000 GSF of meeting rooms, $170 Million.
- **Miller Park**; Milwaukee, WI, baseball stadium, 1.1 million sf, 43,000 seats, $300 Million.
- **Briggs & Stratton Corp.**; Statesboro, Georgia, new manufacturing, diecast and office facility.
- **Briggs & Stratton Corp.**; Auburn, Alabama, new manufacturing and office facility.
- **Briggs & Stratton Manufacturing Facility**; Menomonee Falls, WI, 1,000,000 sf, $30 Million.
- **Allen Bradley**; Milwaukee, WI, various remodeling projects ranging from $1 Million to $5 Million.
- **Dairyland Greyhound Park**; Kenosha, WI, 17,500 seat greyhound race track, $40 Million.
- **Hyatt Regency Hotel**, Milwaukee, WI, new hotel, $30 Million.
- **Menomonee Falls Schools**; Menomonee Falls, WI, additions and remodeling of portions of seven schools, $5.5 Million.
- **Marcus Amphitheater**; Milwaukee, WI, 24,000 seat outdoor amphitheater, $12.5 Million.
- **Wisconsin Drapery**; Milwaukee, WI, new 21,000 sf office and warehouse, 5 month duration, $.9 Million.
- **St. Michael Hospital**; Milwaukee, WI, multiple projects totaling over $10 Million.
- **Bradley Center**; Milwaukee, WI, 20,000 seat sports and entertainment complex, $10 Million.

CHARLES M. ENGBERG, AIA

Engberg Anderson Design Partnership, Inc., Founding Partner
Do4 Associates, LLC, President

Education

Yale University School of Art & Architecture, New Haven, Connecticut
Master of Architecture, 1967
Lawrence University, Appleton, Wisconsin
Bachelor of Art, Major, Architecture, 1962

Professional Status

Registered Architect: By NCARB Exam 1969
States of Registration: Wisconsin, Illinois, Iowa

Teaching Experience

University of Wisconsin-Milwaukee, School of Architecture and Urban Planning,
Adjunct Professor, September 1985 to June 1986
University of Iowa, School of Art and Art History, Department of Design
Visiting Instructor, 1976-78
Iowa State Library Conference, Library Design presentation, 1993

Activities

- Greater Milwaukee Committee, Member
- City of Milwaukee Historic Preservation Commission, Board Member, Three-time Chair 1986-1998
- Wisconsin Trust for Historic Preservation, Past Board Member
- Wisconsin Preservation Fund, Board Member
- Wisconsin Better Business Bureau, Past Board of Directors
- Metropolitan Milwaukee Association of Commerce, COSBE CEO Roundtable

Experience

After three decades of a distinguished nationwide career in all phases of architecture, Charles Engberg founded Engberg Architects in 1987. He is experienced as project designer/manager on numerous large scale projects and individual buildings of all types. Much of his work has won design competitions and awards. Mr. Engberg strives for appropriate as well as cutting-edge design for all projects, whether public institutions, medical, corporate, educational or housing facilities. Recognized for his leadership abilities in master planning efforts, Mr. Engberg has led many projects such as the Land Use Plan for the 1,000-acre Milwaukee County Grounds from the conceptual design through implementation, creating consensus among diverse owners and user groups.

Historical preservation has been a life-long focus for Chuck, and his expertise and sensitivity toward this issue is appreciated by many communities. His position on the City of Milwaukee Historic Preservation Comission Board puts Chuck in a great position to moderate the opionions of many voices to come to one solution.

Under his leadership, Engberg Anderson Design Partnership has become one of the region's major planning, architectural, and interior design firms as evidenced by its unprecedented growth and track record in cultural facility design and many other public building types.

HISTORIC PRESERVATION/RESTORATION

Archbishop Rembert Weakland's Residence, Milwaukee, WI
Historic Renovation

First Presbyterian Church, Menomonee, MI
Master Plan and Renovation of historic 1912 structure. Includes recreation of parlor space, ADA accessibility, interior design and furnishings selection.

First Unitarian Society of Milwaukee, Milwaukee, WI
Master Plan and Renovation/Restoration
Wisconsin Historical Society Award, 1992

German English Academy, Milwaukee, WI
Renovation of former school into office space
Honor Award, 1985, Wisconsin Society of Architects

Historic Deerfield, Deerfield, MA
Intern, Docent

Hoelter Residence, Cedarburg, WI
Historic Restoration and Renovation

Humphrey Scottish Rite Masonic Center, Milwaukee, WI
Interior renovation of this historic building

Laughlin/Constable, Milwaukee, WI
Mitchell Building Penthouse--Media Center with Elevator Enclosure
Design Award 1991, Wisconsin Chapter ASID

Mineral Point Theater, Mineral Point, WI
Master Plan for Restoration

New Brady Street Area Association, Milwaukee, WI
Business Improvement District Project

Pabst Theater, Milwaukee, WI
Structural reinforcement, interior remodeling and addition to this historic theater

Rock County Historical Society- Visitor's Center, Janesville, WI
Historic restoration of 1912 Prairie-Style residence and contextual addition

Sterling North Residence, Edgerton, WI
Historic renovation of famous Wisconsin author's childhood home which includes making the structure accessible

10 Chimneys, Genesse Depot, WI
Engberg Anderson participated on the task force in 1994-95 to secure and preserve the 10 Chimneys estate of Alfred Lunt and Lynn Fontayne as a museum and theater complex. Currently EADP is leading efforts to stabilize the buildings and protect their collections. HVAC systems will be replaced and areas impacted by construction will be restored. A site master plan and new visitor's center is being developed.

Section V

John G. Waite Associates Architects PLLC

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Albany, NY 12207
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Chelle M. Jenkins
Arik W. Mathison
William P. Palmer
Nancy A. Rankin
Stephen F. Reilly

To: Daniel Kabara, Engberg Anderson Design Partnership, Inc.
Mike Scheffler, Wiss, Janney, Elstner Associates, Inc.
Gary Kulwicki, City of Milwaukee

From: John G. Waite, FAIA

Date: February 18, 2002

Re: Peer Review for Phase Two - Exploration and Remedial Stabilization Report for Milwaukee City Hall

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I am pleased to submit the following comments and questions on the Milwaukee City Hall Phase Two -Exploration and Remedial Stabilization study. Because I have not yet inspected the building, these comments are by necessity only preliminary and are intended to assist in beginning the peer review discussion process. Because this is the 99% Draft Report of the Phase Two Exploration and Remedial Stabilization, most of these comments will probably have to be dealt with in the next phase of the restoration effort.

General

- There appears to be a considerable amount of information in the Phase Two draft report. It is difficult to comment fully on the draft report without inspecting the building and/or seeing better quality photographs.
- The existing format of the Phase Two report is awkward. The information in the report needs to be organized and then supplemented by additional information and analysis in the next phase of work. Within the existing report, the data, photographs, and drawings need to be integrated into the various sections to form a more coherent whole. Photographs and drawings, for example, should be integrated within each section. Master elevation drawings, with detail drawings and photographs keyed in, would be very useful.
- The next phase of the project should include a historic structure report (HSR) for the exterior, consisting of a detailed history of the original construction and subsequent modifications. This information is essential in understanding why the current failures have occurred. The HSR should include a description of the exterior, noting where originally specified materials still exist, where substitutions were made during construction, and where subsequent replacements occurred. It should identify missing original/historic features and provide a process to determine whether they should be replaced or not. The history section should be footnoted and significant material included in the appendices. This information is essential in preparing

comprehensive recommendations for the stabilization and restoration of the exterior of the City Hall.

- In the Phase Two report, I agree with the generally conservative approach taken with regard to the preservation of original materials and the removal of later, lower-quality replacement materials. Decisions regarding replacement of original/historic details will require additional research.
- Terms like "repair or restore as needed" should be avoided and specific recommendations should be made after additional investigations and research.
- There should be more emphasis on non-destructive investigation procedures rather than dismantling sections of original/historic construction.
- Agree with initial efforts to protect public safety by installation of netting and sidewalk bridging.
- The original/historic mortar in various materials should be examined and tested to determine how closely they conform to original specifications. Generally it is recommended that mortar joints be raked out to depth of twice the width of the joint. In some cases, this depth may not be sufficient.
- Are there more tests that have been done and results that can be included (i.e. scientific data, graphs, microphotographs)?

Materials

Brick

- Are the existing bricks the same as specified for every location? Report is not clear.
- Is the pointing mortar that exists in each location the same as specified (Portland cement mortar/lime mortar/natural cement mortar)?
- Is it possible that clock gables have always been out of plumb? Are they stable?
- How was mortar analysis carried out to differentiate between portland cement, natural cement, and lime mortar
- Repointing technique – use of power tool grinding can be damaging to brick. Limiting its use to only horizontal joints can be less problematic.
- Surface deterioration – was Energy-Dispersive, X-Ray analysis used to determine composition of atmospheric pollutants on brick surfaces causing eroding, pitting, and spalling?
- Agree with observation that "face grouting" is inappropriate pointing technique for building.
- Agree with observation that use of epoxy is inappropriate repair technique for cracked brick.
- Moisture level tests appear to be needed to help determine causes of brick deterioration below main cornice at 7th floor.
- What is recommended testing to determine cause of cracking at 8th floor level, both where steel exists and where masonry was rebuilt in 1973-74 without it?

- Recommendations – has it been definitely determined that original construction, both with embedded steel and without, must be dismantled and rebuilt (report is not clear)?
- Need more information on helical anchors and how they can be installed without damaging historic brickwork.
- Using salvaged brick can be problematic because of loss of adhesion with new mortar.
- Point joints – can this be recommended without knowing composition of construction mortar and pointing mortar in each location?
- Masonry cleaning – what mild detergent is recommended? Will it remove corrosive pollutants on brick surfaces?
- Need to determine original/historic tooling of pointing mortar.

Terra Cotta

- Every effort should be made to locate original fabrication/shop drawings because they will be invaluable in restoration – this could be part of historic structure report work in next phase of project.
- Precast replacement elements should be replaced with terra cotta.
- Page 19 – hollow metal rods probably wrought iron and not cast iron.
- Should there be more structural analysis of areas where there is failure and/or displacement?
- Replacement of damaged units – there should be piece-by-piece inspection to determine exact quantities as part of contract document phase.
- The recommendation to consider substitute materials such as precast concrete or cast stone should be reconsidered.
- Need more information on helical anchors and how they can be installed without damaging historic terra cotta.
- Tower Clock gables - need to examine more carefully to determine exactly how many units require pinning.
- Seal cracks – is there a more appropriate repair than sealant?
- Point joints – is Type N mortar best choice?
- Seal joints – should replace large voids in mortar with new mortar before applying sealant in horizontal joints.
- Paint spalls - what is most appropriate coating to repair terra cotta?
- If it hasn't been done, Energy-Dispersive X-Ray analysis should be used to determine composition of atmospheric pollutants on surface of terra cotta to determine if they are damaging.

Sandstone

- Observations – need to determine original tooling of pointing mortar.
- Cracks - why are cracks thought to be the result of thermal expansion and contraction rather than from other causes such as settlement?

- Surface distress – could any of the surface damage be caused by atmospheric pollutants? Has Energy-Dispersive X-Ray analysis been done?
- Redressing of original stone should only be done as a last resort.
- Abandoned Anchors - should be removed because they will cause problems in the long run.
- Pre------patinized stone from the quarry is not a good idea.
- Rust-colored stains – need to test to determine if caused by corroding ferrous metal and if staining is damaging the stone. Has testing of chemical neutralizers been made?
- Has use of stone strengtheners (consolidants) on sandstone been investigated?
- Dutchmen repairs – why do stainless steel spring pins or helical anchors need to be used in every case? Has building been surveyed to determine exact number and location of Dutchmen repairs?
- Need more information on helical anchors.
- Is Type N mortar best choice for repairing sandstone?
- Horizontal joints – large voids in mortar should be replaced with mortar before applying sealant.
- Cut drip (22) – what is detail of proposed groove and existing copper strip?

Granite

- Abandoned anchors – should be removed.
- Dutchmen repairs – why do stainless steel spring pins or helical anchors need to be used? Has building been surveyed to determine exact number and location of Dutchmen repairs?
- Is Type N mortar the best choice for repointing granite?

Precast Concrete

- Unless there is some strong reason not expressed in the report, the precast concrete elements installed in the 1970's should be replaced with new terra cotta.

Masonry Cleaning

- Need to evaluate atmospheric pollutants on all masonry areas to determine if they are attacking various materials. Once this is done, a testing program can be developed that identifies the least aggressive agent that is effective in removing the pollutants and cleaning the masonry material. It is likely that each material will require a different cleaning method.
- Need to establish an organized testing program using procedures established for terra cotta (English Heritage)
- Are there photographs of various cleaning tests, as well as drawings showing location?

- Oxalis acid may not be most appropriate agent for removing ferrous stains. Were other methods investigated?
- Agree that cleaners containing hydrochloric or hydrofluoric acids should not be used.

Steel

- When were steel clock faces installed? What was original translucent material?
- Shouldn't a structural investigation of the tower steel be undertaken?
- What rust-inhibitive paint system is being considered? How is lead abatement to be handled as part of abrasive cleaning process? Why isn't needle gun being considered to clean steel?
- Tower spiral stairs – what is "corrosion of fractures"?
- Is tower stair original?
- Need drawing of how supplemental support is to be installed at clock gate (31).
- Are epoxy anchors the best method to attach the steel to the brickwork?
- Embedded steel elements – need more information on why it is necessary to dismantle distressed brick masonry.
- Ground rails – new steel rails to be fostered with non-ferrous-anchors – what type of non-ferrous anchors? And how will electrolysis be controlled?
- Roof creating – cast aluminum is not a good choice as a replacement for iron.

Roofing, Flashing, and Floor Decks

- Need to prepare historic structure report to determine whether slate or copper should be installed on tower.
- Main Building Slate Roof – what type of slate was installed in 1973-74? Where does 70-year life expectancy figure come from? Life expectancy is completely dependent on type of slate and detailing (fastenings, flashings, etc.)
- Gutters – need to replace existing gutter linings and redesign details.
- Slate – need to inspect entire roof and determine whether complete replacement is required.
- Flashing – terne-coated stainless steel has been replaced with TCS II (a zinc and tin alloy over stainless steel), which has different characteristics from terne (tin/lead). Is the proposed flashing near other metals?
- Need to determine if any original copper survives and whether it is hard- or soft-rolled.

Windows and Doors

- It would be desirable to replace single glazing in historic woodwork. Tests need to be undertaken to determine if heat loss is acceptable.
- Cylinder glass would not be appropriate, but a modern glass that matches the original early machine-made glass should be used, if single glazing is to be used.

- Repair wood – Why are epoxy consolidants recommended? Recent experience indicates that there are long-term problems with epoxy consolidants.
- Is window hardware original/historic? If so, shouldn't it be reused and replicated where missing?
- Stained glass – when does it date from? What condition is it in? Are cames lead or zinc?

Interior Finishes and Electrical

- Electrical Lighting – what did original fixtures look like and should they be replicated? (Historic structure report question?)
- Atrium and Stairwell Finishes – agree with recommendations.

Repair Approaches and Constructability Issues

- Can the city utilize procurement methods other than conventional bidding, such as design/build, construction management, two-step negotiated procurement, or negotiated GC contract with competitively bid subcontracts?
- Are there alternatives to using fixed scaffolding to access the entire building?
- What are all the options for phasing the work by section of the building, trades (masonry, roofing), etc.?
- Traditional competitive bidding is not necessarily the best system for the City to control cost, quality, and schedule. Other procurement methods should be carefully investigated.

SGH
Simpson Gumpertz & Heger Inc.
Consulting Engineers
Boston / San Francisco / Washington, DC

19 February 2002

Michael J. Scheffler, P.E.
Wiss, Janney, Elstner Associates
330 Pfingsten Road
Northbrook, Illinois 60062

Comm. 23063 – Peer Review, Phase Two, Exploration and Remedial Stabilization Report, Milwaukee City Hall, Milwaukee WI

Dear Mr. Scheffler:

As requested by Mr. Venu Gupta of the City of the Milwaukee, we reviewed your 31 December 2001 report on the above-referenced project. The following records our comments regarding your findings, conclusions and recommendations. Our comments follow the headings established in the report and generally relate to the overall repair approach rather than the line item repairs to specific elements. We also include an additional section under the heading "Other Issues" at the end of this letter.

This letter does not comment on project scheduling, budget estimates or life-cycle costs. We will be happy to discuss these issues with you after the project scope is clarified and agreed upon at the completion of the peer review process.

1. BRICK

On page13 of the report, you conclude that the vertical cracks in the south bell tower at the 10th floor arches and 12th floor flat arches are "...likely related to overall thermal expansion and contraction of the wall, although the cracks may originally have occurred as a result of moisture expansion of the backup brick. Thermal movement produces tensile stresses in the masonry wall, which cracks at points of discontinuity, such as the keystone of round arches and the ends of flat arches. This appears to be the cause of the large cracks vertically through the center arch in each facade of the Tower at the 10th floor, as well as the vertical cracks at either side flat arch on all four facades of the Tower at the 12th floor."

Although differential movement between wythes of masonry due to thermal and moisture expansion can produce tensile stresses within a masonry wall system, our preliminary findings at the building in April 2001 and our review of the investigative findings presented in your report do not support your conclusion that this phenomenon is the primary cause of the vertical cracks in the locations reported above.

Horizontal and vertical differential movement between wythes of masonry will likely cause bending stresses (similar to bi-metallic effects) in the wall, resulting in cracks on one side only (not through cracks as we have seen and as you report). Under the bi-metallic bending assumption, both vertical and horizontal cracks should be observed in these locations. However, only vertical cracking is reported.

A more probable mechanism causing this cracking is related to arching action of the masonry over the groups of wall openings at the 10th and 12th floors. It is likely that the resulting tension from arch thrust is cracking the wall at head levels.

Vertical compression in the masonry walls, from gravity and wind loads, will be carried, to some extent, by arching action in the wall to the large, stiff corner piers. Since there is no thrust reaction at the corner piers, the arching action creates horizontal tension forces in the wall at the levels of the tops of the openings. Such tension is consistent with the vertical through-wall cracks that we both have observed at the heads of these openings. It is important to note that the floor diaphragms at the10th through 13th levels serve to help restrain the lateral spreading of the corner piers that is induced by arch thrust.

Based on our observations and the observations recorded in your report, we suspect that the mechanism described above is the probable explanation for the vertical cracking in the 10th floor arches and 12th floor flat arches. We recommend, therefore, before any repair work is implemented that a structural study of the tower be commissioned, including further investigation of the existing conditions of floor decks and their interaction with the masonry. We also recommend that any further analysis be verified through physical monitoring of the tower.

2. TERRA COTTA

The following three major areas of the terra cotta repair will likely drive the overall cost and be the most debatable issues: clock gables, soffits, and flat arches.

On page 24 and 27 of your report, you recommend replacement of "about 10 percent" of the clock gable terra cotta and pinning "about 60 percent" of the remaining (including installing sealant in cracks), respectively. In addition, on page 26 you recommend replacing terra cotta "At the upper portion of the four clock gables, dismantle wall and coping units down to the line of the embedded diagonal steel beam; replace damage units, rebuild gable following steel repair."

We agree that the amount of distress in the clock gables is significant. As you point out in your repair recommendations, 70 percent or more of the clock gable terra cotta requires some level of intervention. Replacing such a small quantity of terra cotta in the clock gables will require constant monitoring of the remaining terra cotta pieces. In addition, the sealant will require replacement on an on going basis and will be only marginally effective in keeping water out of the wall system.

Given that an overwhelming percentage of the terra cotta requires repair, the ongoing monitoring required of the retained terra cotta, and the difficulty and cost to gain access, we suspect it will be more economical on a life-cycle cost basis, and certainly more reliable and durable, to replace all the terra cotta in these locations at this time. Making the repairs that you recommend does preserve the historic fabric. This needs to be weighed with the cost of maintenance and the overall wall performance to perform the correct scope of repairs. We do

not believe that continuing maintenance of the terra cotta on the clock tower faces is a viable option.

We also agree that the soffits on the 7th and 9th floors in the tower should all be replaced due to the level of distress cause by corrosion of embedded metal elements. On page 26, however, you recommend replacing only about 15 of the 7th floor soffits on the main building. We do not find in the report how this number was determined or its basis.

We also do not find in the report an assessment of the flat arches over the rectangular windows in the main building. Based on your openings and the reinforcement found in the flat arches in the tower, it is likely that the flat arches are similarly reinforced and may pose a future falling hazard, which is not discussed.

We recommend that a more detailed study of the soffits and flat arches be conducted to better determine and predict the quantity of required replacement and future maintenance issues.

3. SANDSTONE

No substantial comments.

4. GRANITE

No substantial comments.

5. PRECAST CONCRETE

Although the reinforced precast modillions at the 7th floor appear to be in sound condition with little or no corrosion of embedded reinforcement, we do not find in the report any discussion or analysis of the depth of carbonation in the concrete. An understanding of the depth of carbonation, especially if the steel is contained in the zone of carbonation, is critical to predicting future performance of the modillions. If the embedded reinforcement has lost the passive alkaline concrete layer (through carbonation), corrosion of the embedded steel can initiate.

The presence of additives, such as chlorides, that may have been placed in the concrete during casting also must be determined. Chloride additives are known to accelerate corrosion of reinforcing steel, and were not uncommon additives to concrete materials in the early 1970s.

We recommend that the modillion concrete be randomly sampled and tested for the depth of carbonation and additive content, if any.

6. MASONRY CLEANING

No substantial comments.

7. STEEL

On page 46 you report, "Virtually all those steel elements that are embedded into masonry have a heavy build-up of corrosion. This is due to moisture in the masonry causing a greater rate of corrosion on the embedded steel, and also because the embedded steel elements are not generally accessible for inspection or maintenance. The vast majority of embedded steel

elements that were inspected retain sufficient steel section in spite of the heavy corrosion." ..."Even at locations where cracked masonry was coincident with corroded embedded steel, such as at the anchor straps and pins of the beams supporting the 13th floor deck, the cracking in the brick masonry continues well beyond the steel element and does not appear directly related to the degree of corrosion observed."

In Appendix W18.5 – Clock Gable Framing, you describe the investigation of one of the diagonal embedded beams with a boroscope as "It appeared to be extremely corroded." You further state, "The tall masonry gable wall is braced against overturning movement only by the small steel tees that support the clay tile roof deck. The connection of these tees to the diagonal beam frame of the gable could not be determined."

We agree that corrosion of embedded steel elements is a significant problem, which occurs in many locations where steel is embedded in masonry walls. This building's history shows that corrosion of steel elements has been a primary factor behind many of the previous repair campaigns and is likely to be a major repair item for the next. The previous repair campaigns were largely a reaction to distressed or fallen masonry caused by corrosion of embedded steel. Many of the recommendations found on pages 47 and 48 (numbers 30 and 33) are reactive measures, which deal with specific isolated elements.

The building's history shows that a repair program that is simply reactive to ongoing corrosion will guarantee another extensive repair episode in the next 10 to 20 years. We recommend consideration of preventative measures now to deal effectively with the causes of the corrosion.

You conclude on page 26 that cathodic protection is not appropriate: "Because the steel elements in the building are discontinuous, cathodic protection system would require attachment at every individual steel element, including those elements not otherwise requiring repair."

We agree that many steel elements in the main building are discontinuous, but techniques are available to bond these elements together. The frame of the tower spire is continuous, which may make it a potentially excellent candidate for cathodic protection, especially for the hangers and pins at the ends of the floor beams. The potential for cathodic protection requires more study, rather than simple dismissal, as a means to address the root cause of the corrosion problem. Other methods exist to reduce corrosion potential, including coatings and the installation of flashing, and should also be considered. Simply treating the symptom (individual corroded steel members) should not be considered given the building's history.

Therefore, we recommend a comprehensive study of all the steel to determine the level of current and future corrosion potential. This study should also include and provide:

- A list of priorities and a discussion of probable consequences, if repairs are not implemented on a timely basis.
- Trial mock-ups to determine the feasibility of cathodic protection and/or any other proposed treatment of the steel.
- A long-term strategy so that corrosion can be dealt with in a forward-thinking manner, which can be planned and executed as needed.

8. ROOFING, FLASHING, AND FLOOR DECKS

We agree that the copper on the spire of the tower and the flat roofs on the main building and tower should be replaced. Prior to developing construction documents, we recommend that the flat roofs be tested for asbestos and that the feasibility of retaining the book tiles in the spire be determined.

We also agree that covering horizontal projections, such as the top of the 7th floor cornice, the 3rd floor sills, and the 8th floor balcony in the tower, with metal flashing is a prudent measure. We would also recommend this repair for the 7th and 2nd floor sills on the main building and bell tower, respectively. Installation of flashing under adjacent windowsills should be considered as part of the work.

We disagree that installing heat trace in the 7th floor gutters and hopper between the dormers will have a large impact on reducing ice-damming effects along this area. Heat trace is difficult to maintain, breaks down often, and has too limited an area of influence for effectively melting snow and ice.

9. WINDOWS AND DOORS

We agree that the insulated glazing units (IGU) are likely at the end of their service life. This is, however, too significant an issue to base on speculation. We recommend frost point testing of a statistical sample of non-fogged IGUs to determine their likely future performance.

From the description of the leakage paths on page 57, we conclude that an unwept glazing pocket coupled with the use of an interior glazing stop is a significant source of water infiltration. This conclusion is consistent with our observations.

We agree that, based on energy savings alone, the use of an IGU replacement unit is probably not justified. IGU replacement should be considered, however, for the additional advantages of occupant comfort and condensation resistance. We agree that interior storms can substantially achieve these goals as well as providing a longer service life.

The presence of an unwept glazing pocket is likely contributing to the IGU seal failure and/or leakage. If the City of Milwaukee requires replacement IGU, the sash should be modified or replaced to provide a wept glazing pocket and watertight interior glazing stops.

10. INTERIOR FINISHES AND ELECTRICAL

On page 61, you indicate that the most obvious areas of interior damage are areas of plaster on the inside of exterior walls on the 7th and 8th floors. However, no mention is made regarding the likelihood that the plaster damage on the inboard side of the 8th floor dormer cheek walls is due to ice-damming effects of retained snow behind the snow fences spanning the opening between dormers. This is a likely scenario for much of the damaged plaster, especially the along the cheek walls of the dormers.

We recommend that this issue be investigated before any repair work begins. If this assumption is correct, the cladding on the cheek walls will require removal and replacement with a back-up waterproofing integrated into the slate roofing underlayment, and eave and gutter flashing.

In addition, we observed significant leakage adjacent to west windows in Room 801 in the south tower. You do not report this condition, or the causes of the leakage.

11. TEMPORARY STABILIZATION

Until construction begins, we recommend semi-annual inspections be made of the deteriorated portions of the south tower and the temporary stabilization measures installed in 2001.

12. OTHER ISSUES

The objective of the City for the restoration project is not clearly defined in this report. The report implies that it is the City's objective is to re-establish the original historic features and character of the building, with improved durability features/details to extend the useful life of the exterior facade. In that respect, how is a "long-term" view defined?

- 100-year repair with routine maintenance, with expected remedial restoration at year 50?
- 50-year repair with routine maintenance, with expected additional restoration at year 25?
- Or how else is "long-term" defined?

The proposed repairs, categorized by materials for the south tower versus the main building, are very detailed in the report. We recommend that the repairs are identified on elevation drawings, so the full scope of work for each element/component of the exterior facade is well understood. This approach will clarify how the repairs are related to each other, and whether the repair recommendations are comprehensive in scope.

We look forward to meeting with you to discuss the specifics of this project.

Sincerely yours,

Brent Gabby, P.E., Senior Staff Engineer
BG03-02.tcs

cc: Daniel Kabara, AIA, NCARB
Gary Kulwicki, P.E.

Peer Review

Milwaukee City Hall
Phase 2 Study -- Exploration and Remedial Stabilization

Comments from Chambers, Murphy & Burge Restoration Architects, Ltd.
18 February 2002

General Notes:

1. In regard to Philosophy, it will be helpful to have some discussion with the Peer Review Team as to the philosophy of the restoration of the City Hall. What are the particular goals of the restoration project? It will help to understand the driving forces and the theoretical basis upon which the decisions are made. (For instance: a lot of money was poured into restoration in Rome and into cleaning the streets of graffiti in order to make a good impression on cultural tourists during the Holy Year.)
2. Some of the cross references from text to images are left blank.
3. Need a AGlossary of Terms@. Some terms are used interchangeably and meanings may be lost without valid description of term meaning relevant to this project.
4. There is a lot of information within this study. Hopefully, a tour of the building will help to clarify some of the information and the rest will be the subject of discussion. It is difficult to give justice to this much work with a cursory review.

Executive Summary

5. In regard to the Part 1 Study: Is it fully incorporated into the Part 2 study? If so, how? If not, is it available for review?
6. There was a Asecond opinion@ completed in June of 2001. Is that opinion available?
7. Were the following completed as a segment of the Part 2 Study: flashing, stained glass, sealant compatibility test?
8. Introduction Page 2 BrickBthere are a couple of typographical errors that could change the meaning of the sentences.
9. Introduction Page 2 BrickBFirst and second sentences seem to contradict each other. There are some fairly comprehensive and extensive recommendations made which seem, also, to contradict the conditions. (Specific questions are raised under the Brick section)
10. (Specific questions are raised under the individual materials sections.)
11. A Cyclical Maintenance Plan would reinforce WJE recommendation for continued maintenance on the building and is part of the scope of work for this project. Is it part of the peer review process? If so, is it complete and is it available?

Introduction
Phase One -- Methodology and Review

12. The extent of interior work described as Part 1 is Ainterior plaster, exposed clay tile and structural steel, and windows that show evidence of water penetration form the exterior@. Is that the same for Part 2?

Phase Two B Methodology

13. Cleaning and Testing are mentioned as part of the Methodology. Is there a list and a description of the types of cleaning and the types of laboratory tests completed?
14. Is there a comprehensive list of Atypical categories of distress@? Or is this something that is addressed only as each material category is addressed?

History/Chronology of Construction

15. This section is very helpful.

16. Of particular note:
    A. Building was harshly cleaned B 1500 psi water pressure B WJE notes (later in the Study) that there is apparent damage from the prior cleaning method.
    B. Building was coated with a clear acrylic resin sealer (1974). Consistent with observations by WJE (later in the Study), there is damage from this process as well.
17. HABS documentation was instrumental in compiling the chronology of treatment for this building. It is recommended that WJE and the City of Milwaukee donate a synopsis of their final documentation to the HABS collection.

Materials
Recommendation Approach and Prioritization

18. Four categories for prioritization are recommended herein; the scope of work suggests five. The aesthetic issues are combined with Along term repairs@ for the purposes of prioritizing. Is that to suggest that no appearance or aesthetic issues will be considered in the Anear term repairs@?

Brick
Observations

19. Was there a determination made as to the cause of the Aout of plumb@ gable walls? Were the walls built that way or is it a structural issue that must be addressed?
20. Was there any determination (by observation or testing) of the composition of the white and black streaks on the brick? (Mildew? Calcium chloride? Carbon deposits?)
21. Was a test completed to determine the compressive strength of the historic mortar? Or for the replacement mortar (from previous repointing)? Was there a test completed to determine the compressive strength of the brick?
22. Are there any photographs of the mortar/repointing test areas? Grinding tools can be difficult to control on a 1/4" joint.
23. Agree that it is likely the improper water pressure pitted or eroded the brick surface; it is not so likely that spalling was caused by the same.
24. Re: thermal movement. Mortar is the sacrificial part of the brick masonry system. If the system is properly assembled, should not the mortar crack instead of the brick during thermal movement? Is there another possible reason for vertical cracking?
25. Re: Clock gables. Several possible reasons are stated for the gables being out of plumb. Is it possible to narrow down the reasons? Are they leaning in or leaning out? (Outward leaning is implied, suggesting something other than wind load.) Were they built that way? Is there adequate bearing for members that bear on the gable walls? Are the wythes of the brick acting together or have they separated?

Recommendations

26. Good idea to replace steel only if there is significant section loss. With what will it be replaced? More often steel will be repaired. Sandblasting not recommended if steel is adjacent to brick or terra cotta.
27. Re: lateral wall ties. Are there currently any lateral wall ties in the system? If not, what is the indication for their addition to the system? What material is recommended?
28. Have the areas that are called for Arebuilding@ been reviewed from an *aesthetic* perspective as well as an *ease of repair* perspective? How visible are each of these locations? Should any of these locations be considered for reuse of existing brick to protect the appearance of the building?
29. Helical ties are a good method of anchoring the wythes of brick together. What material are the ties? Are they installed in the new mortar joints?
30. Have the structural reasons for the cracked bricks been determined? Is it possible to rectify the structural problem?
31. If brick is being replaced in some areas, should not the cracked bricks be replaced? Is new sealant the proper repair for this problem?
32. Has it been determined that the stained brick cannot be cleaned? Is replacement the proper approach?

33. Re: Pointing joints. Method is good. Has the compressive strength of the existing brick and mortar been tested to know that Type AN@ mortar is appropriate? 100% repointing will make the building look Anew@. Is that the desire?

Terra Cotta
Observations

34. Page 18. There is an apparent typographical error that changes the meaning of the descriptionBlast paragraph under AObservations@, second sentence.
35. Semi-circular joint coversBfurther clarification, including material, should be provided. Were they original?
36. Is the described vertical cracking in the terra cotta flat arches located in the terra cotta units or in the joints? Same question for the cracking in the clock gables. By noting WJE observations at these two points, the cause for cracking on the gables is the splay in the corroded steel. The same is not true for the flat arches. Is this correct?
37. Were the terra cotta units pinned (October 2001) through the face of the terra cotta?
38. Have load calculations been completed to determine if additional support is needed at the locations where (terra cotta) crushing has occurred?
39. Are there steel or cast iron supports/reinforcing in the mullions?
40. Is there a disproportionate amount of credence given to the unaccommodated expansion in the terra cotta (and brick)? Water damage is great, both by erosion and by freezing, though the freezing damage may be exaggerated because of the sealants applied in the 70's that did not allow water and soluble salts to escape from the masonry.
41. The suggested use of substitute materials may be appropriate under WJE recommendations B have substitute materials been investigated?

Recommendations

42. New stainless steel anchorage is recommended B is this to replace existing anchors? Or in addition to the existing system?
43. AReplace existing steel where severely deteriorated@ B with what material? Note that later in the paragraph the recommendation is for stainless steel anchors.
44. Re: Cathodic protection. WJE recommends against it. AGREED.
45. Re: Pin in place repairs. Is the recommendation for pinning with helical ties through the face of the terra cotta units or in the new joints?
46. Re: Seal Crack. If the cracks occurred to allow movement, should not an alternative location for movement be accommodated and then an accepted terra cotta patch method be adopted for units that are not severely deteriorated?
47. Re: Pointing. Is type N appropriate to the compressive strength outlined by WJE tests? Does type N meet the color and texture requirements to match the historic mortar?
48. Terra cotta is very susceptible to edge damage by use of repointing tools, would it not be prudent to consider maintaining any existing tight joints?
49. Re: Seal joints. Has the compatibility of the sealant and the terra cotta been researched? Silicone sealants tend to attract airborne carbon and to look dirty. Has the option of the traditional method of repairing joints been explored (cleaning the joints and replacing with compatible mortar)?
50. A terra cotta masonry system typically has weep holes to allow water that has breached the system to escape. Has any consideration been given to identifying and maintaining the weep holes in the terra cotta?

Sandstone
Observations

51. Re: Iron staining in sandstone. Iron in the sandstone can be cleaned, but it returns very shortly after cleaning. New Berea Sandstone (same quarry) is greatly veined with iron. It may be necessary to carefully select any replacement stone (to avoid too much rust color), but as WJE recommends, attempting to clean

the iron from the existing stone or to patinate the new stone are unnecessary.

Recommendations

52. AGrout@ is recommended for the Ajoint@ between the stone dutchman and the existing stone. What is meant by Agrout@?
53. Exfoliation of spalling sandstone (surface consideration only) and re-dressing is most likely the best approach to the problems on this sandstone. The sheeting (or layer exfoliation) of this stone is likely aggravated by the coatings that were applied in 1974. If the outer layer of the stone is removed, hopefully, so will be the problem. Honing and tooling will give the existing stone a better appearance without jeopardizing the stone with side effects from consolidants or sealants. Also, per WJE recommendation, re-patinizing or pre-patinizing is not necessary.
54. Is the Apinning@ recommended in this section through the face of the stone or in the new mortar joints?
55. Is use of sealant for repairing cracks in sandstone the best solution? Have compatibility tests on the sealant been completed? If cracks are due to movement, perhaps a solution should be engineered to avoid using the cracks in the sandstone for the same.
56. Re: Pointing. Type N mortar is specified. Has the compressive strength of the mortar been compared to that of the sandstone? The mortar must remain the sacrificial part of this masonry system.
57. Re: Sealing Joints. Horizontal joints are recommended in this study to have Asealants@. Traditional methods include appropriate repointing mortar. Combined with proper flashing, skyward joints can avoid water infiltration more effectively than sealants which are likely to pull away from the stone, discolor the stone, or pull small pieces of the stone from the wall. The life of the sealant may be long, but the life of a sealant joint is no longer than that of a mortar joint, maybe less. Also, use of sealants tends to foster complaisance with regard to regular maintenance inspections.
58. Re: Beaded Joint. What is the extent of existing beaded joints? If there is a large extent of beaded joints, repairing the same should be considered. If there is very little evidence of beaded joints, the originally specified intention seems appropriate as stated in the study.
59. Re: Drip. Is the copper strip an original detail? Does it work at all? Can it be bent to work? If it could be used, it would save the effort of routing a new drip; if it does not work, the new routed drip should.

Granite

Observations

60. Re: Abandoned Anchors. Abandoned anchors should be removed as they allow water into the granite and ferrous anchors will expand as corroding, placing pressure on the granite.

Recommendations

61. Re: Partial Dutchman. If areas of Asignificant surface damage@ are less than 4", is a dutchman necessary?
62. AGrout@ is recommended for the Ajoint@ between the stone dutchman and the existing stone. What is meant by Agrout@?
63. Re: Pointing. Is type N appropriate to the compressive strength outlined by WJE tests? Does type N meet the color and texture requirements to match the historic mortar?

Precast Concrete

Observations

64. Several methods of removing the coating from the concrete terra cotta replacements were tested. Is there a preferred method? When the solvent-based strippers were used (Peel-Away 7 for example) was the surface of the concrete tested for residues that may interfere with re-applying a coating?

Recommendations

65. Has the proper patch method been determined?

Masonry Cleaning

66. What is the goal for the cleaning? Is it to make the building look Anew@ again? Or to remove harmful deposits and previous coatings?
67. WJE stated in the study that perhaps the sampling should be completed again in warmer weather, this reviewer agrees.
68. It will be helpful for reviewers to see the sampled areas.

Steel

69. Page 45 - Is the Aexposed@ steel spiral stair case in the tower exposed to what? Weather? Clarify if you mean that Aexposed steel@ is not embedded or is exposed to environmental conditions.
70. Page 47 - Can you expand / clarify A a detailed structural analysis of the tower steel was not performed....the accuracy of such analysis would likely be questionable....actual loads are not known.@ This directly relates to the recommendation that the entire channel be exposed & patched as needed.
71. Suggestions for your ARecommendations@ section.
Add correction of the source of the corrosion, where possible to the list of requirements, or cross reference to that repair section. In this way there is an understanding of the sequence of work.
72. Add testing areas of steel cleaning methods.
73. Item 31 - Page 48 The information on the conditions that supports the recommendations here is located in the inspection locations notes. It took some time to find this information. Add a summary paragraph on the conditions of the Clock Gables to the Discussions and Conclusions sections and refer to the inspection locations notes.
74. Item 32 - Page 48 Same as above
75. Item 34 - I agree with your recommendation but would have worded it differently. Reconstruction of the original translucent panels, is an appropriate and more desirable approach, than repair of the extant, but not original material. Had the extant material been in good condition, or an easily maintained material, there may have been other alternatives considered.
76. Item 35 - There should be some discussion here as to whether it is known that the existing railings are original. Some discussion of repair or replacement of original fabric should be discussed. Similar to Items 31 and 32 there is little or no discussion of this item in the Discussions and Conditions Sections.
77. We recommend that this be worded so that it is clear that the anchors should be imbedded into the masonry joints wherever possible.

Roofing, Flashing, & Floor Decks

78. Typo : Last paragraph, line four, AOn@ should be Aone@.

Recommendations:

79. General question: Have the built-up roofs been tested for asbestos? The existence of asbestos will impact costs of removal.
80. Item 42 - page 54 Are the joint covers to be reinstalled? A maintenance program for skyward joints should be recommended.
81. Item 56 - Suggest that this work be coordinated with the installation of the reconstructed ridge cresting.
82. EPDM B Understanding that the life on this type of roof is shorter than other types of roofing, is it appropriate to install EPDM adjacent to materials whose long life you are trying to protect (adjacent materials are disturbed when a roof is replaced)?

Windows and Doors

83. There is no discussion in the text on doors. Were they evaluated?
84. Item 50 - page 60 Clarify AThe shape of the new weather stripping would likely resemble a channel.@
85. Item 53 - page 60 It is common when installing insulating glazing in a wood sash to route a larger rabbet depth to hold the glass in place. Is there any evidence that this occurred?
86. Item 54 - page 60 What was the original window hardware system?

Interior Finishes and Electrical

87. No comments, as this work is beyond WJE scope for the project -- it is very general.

CRM
Construction Resources & Management

8002 RFD, Long Grove, IL 60047
Tel: (847) 566-2800 • Fax: (847) 566-0700

By Fax and US mail

Mike Scheffler
Wiss, Janney, Elstner Associates, Inc.
330 Pfingsten Road
Northbrook, IL 60062

February 14, 2002

RE: Milwaukee City Hall - Exploration and Remedial Stabilization Cost Estimate - Peer Review

Dear Mr. Scheffler:

As instructed by the City of Milwaukee we have reviewed the cost estimate for the proposed remedial work to the Milwaukee City Hall.

The cost estimate was prepared by WJE and was included in the documentation submitted to us as part of the Peer Review process in which we are participating.

Based on our review of the documents we have the following questions that we would like you to address:

- Please clarify the basis of the escalation amount added to the estimate.
- Please provide a breakdown/calculation demonstrating the basis of the general conditions.
- Please provide a breakdown/calculation demonstrating the basis of the overhead and profit addition.
- Please provide data supporting the scaffolding costs.
- Please clarify how much was included for the materials hoist.
- Please confirm that the cost of an operator for the hoist has been included.
- Please confirm that the costs include a sidewalk bridge to protect pedestrians in the vicinity.

CRM

We look forward to discussing your responses at the Panel Review Session commencing February 28, 2002.

Sincerely,
CONSTRUCTION RESOURCES & MANAGEMENT

Simon Dvoretsky

Simon M. Dvoretsky

cc Dan Kabara - EADP

Questions:

1. Did the scope of the investigative work include any moisture meter readings taken at different depths of the masonry walls at different locations?
2. Was the original building mortar(s) too strong for the masonry design?
3. What is the expected compressive strength of a 1:1:6 mortar after 28 days?
4. It appears the original architect did not desire face brick mortar joints larger than ¼". Do the tight joints restrict the overall flexibility of the masonry wall?
5. What benefits are gained by installing mortar in three lifts during pointing?
6. Why is one mortar type, Type N mortar, specified as the replacement mortar for all masonry repairs? The granite, sandstone, face brick, back up brick, and terra cotta all have different vapor transmission rates and thermal expansions. Should the repair mortar take this into consideration in the effort to establish some compatibility?
7. What are the key performance criteria for the replacement mortar(s)?
8. Why did the epoxy repairs fail in the terra cotta?
9. If the cream colored back up brick expanded twice as much as the face brick, then how is it that the cream colored backup brick is not cracked? (page 12)
10. Will there be any repair method to accommodate future movement in the face brick?
11. What is the life cycle performance of the sealant proposed for the horizontal joint surfaces?
12. How will the contractors be prequalified if the city would like to proceed with a traditional bid contract?

Comments:

REFERENCE: Mortar Analysis – MSE 1
I am interested in specific details of the aggregate sized lumps of hydrated lime found in the sample. Aggregate sized lumps of lime found in mortars from this period are generally a result of lime putty not being thoroughly mixed with the sand.

It is interesting that lime was found in this sample. The original specifications only called for Milwaukee cement and clean lake sand with Rickertsen's mineral mortar color.

REFERENCE PAGE 34
Original specifications call for the joints to be struck off. This may not be the same as tooled to a concave profile as we understand it today.

REFERENCE PAGE 31
Precast concrete modillion brackets supporting the main cornice could be limewashed in a color to match the surface of the adjacent terra cotta.

Submitted by,

John Speweik
U.S. Heritage Group

Questions and Comments for the
Milwaukee City Hall Phase II Study-Exploration and Remedial Stabilization

Provided by: John B. Krouse, C.E., 2-16-02

1. You are specifying the mortar joints to be ground out ½" using power tools and hand tools. I would recommend ¾" mortar depth.
2. I cannot find a systematic plan to solve the problem of thermal movement and expansion. Will there be a plan detailed prior to the commencement of this project?
3. The document makes mention of the 'average expansiveness percent' for the face brick and the backup brick, however, I cannot find any data supporting this finding. Please explain.
4. Referring to WJE's findings on the main building, 7th floor cornice. I am concerned about the excessive corrosion of the 'T' angles that support the cornice. I am also concerned that the replacement pre-cast concrete modillions are near the end of their life cycle, especially when they are spalling from rusting reinforcement that is embedded in the pieces. It might be better to remove, replace rotten steel and reset or replace the cornice, along with the installation of appropriate flashing.
5. The 7th floor soffit level appears to have a rusting 7/8" steel pipe for support. It might make sense to systematically replace these projecting conditions in light of the areas of cracked terra cotta and rusted piping. This would eliminate the possibility of cracked terra cotta falling off the projections.
6. Pertaining to the negotiated contract schedule, what is the purpose of a three-month gap between the study approval and the beginning of the preparation of the bid packages?
7. If a negotiated contract were to take place, it would be more advantageous for the city to purchase the terra cotta directly from the manufacturer. This way the terra cotta manufacturer can begin the survey and shop drawing phase much sooner allowing for better timing for the installer. With a project of this size and scope, the manufacturer will need at least 6 (six) months lead-time on the installation contractor. The months of September and October, in Milwaukee, would most likely provide better weather conditions for the terra cotta survey team and the sample removal by the contractor than to wait to begin this phase in November and December. If need be, the city could have a separate negotiated contract directly with the manufacturer and the sample removal contractor for only this initial phase to expedite these first steps.
8. The cost per unit of the terra cotta seems low. WJE indicated approximately $300.00 per unit, delivered. Given the size and style of the units, a per-unit cost of $500.00 is more realistic.

9. The negotiated contract schedule does not have a slot for setting up the tower scaffolding. When would that take place?

10. Under Appendix C, Cost Estimates for the Tower, Division 4-Masonry, B Terra Cotta, Item 10C states 'rebuild upper portions of gables'. How many terra cotta units are estimated as required for this area? My calculations, based on WJE's cost per unit, seem to imply 667 units. Is this the quantity you would agree is required for this area?

11. The concrete patches on the building that were done in previous repairs appear to be failing. Is there a plan to remove all concrete patches, or only selected areas?

12. I would like to recommend the use of lead 'T's' on the skyward joints in lieu of sealant alone.

13. If the building is going to be cleaned, will the terra cotta be done before or after masonry repairs? It would be preferable for the cleaning to be done after the re-pointing, but prior to the installation of new terra cotta.

14. What is the fastening system for the 1973-74 pre-cast brackets at the 7th floor cornice? Is it strictly counter weight? If it is not counter weight alone, the steel supports should be examined for strength and stability.

February 18, 2002

Mr. Daniel Kabara AIA, NCARB
Engberg Anderson Design Partnership
61 North Broadway
Suite 517
Milwaukee, Wisconsin 532002-5004

Re:Milwaukee City Hall Historic Restoration
Exploration and Remedial Stabilization Study - Peer Review

Dear Mr. Kabara,

As requested, please review our questions and items for consideration below for the Milwaukee City Hall Restoration Project.

1. Has there been an investigation and/or study of the condition of the foundation - footings or piling?

2. Will the stabilization measures done during the Phase Two study be adequate to provide Life Safety issues during the 3 to 4 year construction schedule?

3. Should an investigation of the availability of Grants for historical restorations through the state or federal governments be done to determine if any funding is available?

4. MBE/WBE/DBE participation requirements should be considered for this project and how they may be achieved.

5. Other funding sources could be considered such as personalized charitable brick pavers ,etc. A "Blue Ribbon Panel" could be used to investigate various options.

6. The choice of traditional bid versus negotiated should be studied more closely. The long lead time required is a critical element when considering what type of contract to use. The impact of material measurement, shop drawings and manufacturing time is critical to maintaining budget and schedule. Access to the work is necessary to provide accurate information to manufacture specialized stone and terra cotta pieces. The winter weather will also impact schedule. Some work could be done in winter while others may not. The schedule could be compressed with either contracting method, but budget considerations may be affected.

7. Are sources for the stone, brick and terra cotta materials that provide a good match identified already? The Phase Two study stated 6 months is necessary for terra cotta deliveries. This should be done early in the pre construction process to avoid delays. Additional scaffolding could be installed on adjacent sides to provide terra cotta manufacturing to move ahead faster instead of an "on and off" schedule. This could lead to a smoother work flow as well as a shorter schedule.

8. The Phase Two study does not explain what structural analysis might be necessary to provide adequate reinforcement of areas where structural steel is more seriously damaged. Will further inspection be necessary from the project scaffolding or has enough information been collected to perform any structural analysis? Is the structure adequate as originally designed or will modifications be necessary to correct any deficiencies or bring the structure compliant with current building codes?

9. Owner Direct purchases may be used to purchase the brick, stone, terra cotta and any other substantial materials to save the tax costs. Any material ordered could be stored off site until needed.

10. The entire building restoration scope should be prioritized relative to Life Safety, Water Infiltration, and Structural Damage relative to budget and timing. The vaulted sidewalk repair work required may have an impact on the engineering of the scaffolding placed on it. Additional shoring under the vaulted walks may be required. If the sidewalks are to be filled in, this may not be necessary if done prior to the restoration work. If the vaulted sidewalks are being rebuilt or repaired, the restoration work could be done before or after the vaulted sidewalk work.

11. There is no discussion of the Skylights. Are they in good condition or will any work there be part of this Project?

12. No discussion of any lead, mold or asbestos survey was found. Such a survey is normally the Owners responsibility and should be done early if it is not available already. This is necessary to provide a safe working environment for the City personnel in the facility as well as the construction crews working on the Project. It is easier to plan for these issue when known and can be included in the scope. The impact on the budget and schedule can also be included during pre construction planing to avoid unexpected delays and costs at a later date.

13. Once this project is completed, a long term maintenance program of inspections and maintenance should be developed to prevent water infiltration and other detrimental sources of damage during the expected life cycle of the restoration Project. This can be developed with all the parties involved in the project and will help ensure the anticipated life of the current repair program be achieved.

14. The scope of any testing is not discussed but is listed as a Budget Line Item as the "Design, contract documents, observations, testing line item at 10% of Overall Total." Is this enough to cover all testing required for the Project as well as "Design, contract documents, etc."?

15. There is no discussion of Insurance cost. There should be some discussion of the costs for Builders Risk, General Liability, Property Liability etc. and who will pay for them. There also is no mention of Performance and Payment bonds. These issue will have costs and will be a budget issue.

16. Details of the Scaffolding estimate would be helpful to analyze erection issues, maintenance costs, phasing and removal requirements. These costs are critical to determine whether it is cost effective to proceed consecutively on various sided or to wait during the winter season. Historically it is less expensive to proceed faster with more work progressing simultaneously, but the scaffold expense must compared to extended general conditions, inflation, maintenance, and wage increases. Budget may be the controlling factor relative to trying to accelerate this project.

17. Further discussion should be done regarding Life Safety as it relates to users of the building during construction. This affects egress and ingress, site usage, staging during construction. The requirements of the City of Milwaukee for Accessibility well as Emergency procedures should be considered. Security issues should be included especially in light of the heightened awareness due to the recent 9/11/01 attacks. Heightened security measure might be implemented for construction crews as well as possible access through temporary structures and enclosures. All of these issues have budgetary implications.

18. Although the costs involved would be carried by the City of Milwaukee, it should be anticipated that some City employees might need to be relocated and / or rescheduled to accommodate the work. The impact of the work on the City employees should be planned into the schedule and budget.

Thank you for the opportunity to participate in the Peer Review Process. We look forward to the tour, upcoming presentations and evaluations. Please send me a schedule of these events. If you have questions, feel free to contact me.

Sincerely,

Joel Becker PE
Vice President Field Operations

cc John Hunzinger Hunzinger Construction
Larry Palank Hunzinger Construction