HISTORIC STRUCTURES REPORT
Architectural Data Section
PART II (Portion)
ON
OLD CITY HALL
Independence National Historical Park
Structural Rehabilitation

Prepared by
Lee H. Nelson
Architect
May 1963
Memorandum
To: Regional Director, Northeast Region
From: Assistant Director, Design and Construction
Subject: Historic Structures Report, Part II (portion), Architectural Data Section, Old City Hall, Independence

The subject report has been reviewed by the interested Divisions and they concur with the recommendation contained in your June 14 memorandum. I have approved the subject report this date.

A. Clark Stratton

cc:
Chief, EODC (2)
Supt., Independence
Memorandum

To: Director

From: Regional Director

Subject: Historic Structures Report, Part II (portion), Architectural Data Section, Old City Hall, Independence

The subject report was reviewed by Regional Director Ronald P. Lee yesterday and is recommended for your approval.

Your early review of this report would be appreciated.

Regional Director

Enclosure

cce:
Chief, LOSC
Supt., Independence

MHNelligan/bg
General
Daily
Area
Mr. Barnes
Historic Structures Report

II Old City Hall, Arch. Data Sec.
Part Structure

Project: Nature of, funds & f.y. programmed

Sections:

Admin.
Called for
Rec'd. DONE

Hist.
Called for
Rec'd. DONE

Architecture
Called for
Rec'd. 5/6/63

Review:
distributed Park 5/6/63
" EODC
" WASO
" Region 5/9/63

Approved:
Park- 5/6/63
EODC 5/6/63
WASO
Region - 6/18/63

(Note: Cross-line accomplished items, with dates when done, received, etc. Crossline whole sheet, when report is over.)
HISTORIC STRUCTURES RPT., PART II (Portion)
OLD CITY HALL, Architectural Data Section

Asst. Regional Director (CH)
5/3/63

History & Archeology

☑ History
☑ Archeology
☑ Mos. Hts.

Excellent, but no Admin Data on these.

Very good work, doc.

Operations & Maintenance

Select 4/5/63
Retr邱le 5/4
Salvino 5/6

Job excellent but I had to put some of the pages back into correct sequence in folder.

Programs

Chick 6/16

Dr. Nelligan - last

OK - formal approval.


Memorandum

To: Regional Director, Northeast Region

From: Superintendent, Independence

Subject: Historic Structures Report, Part II (Portion), Architectural Data Section, Structural Rehabilitation of Old City Hall, Independence

Subject report has been reviewed and is hereby approved as of this date.

M. O. Anderson
Superintendent

In duplicate

cc:
Chief, EODC
Memorandum

To:    Regional Director, Northeast Region

From:  Superintendent, Independence

Subject: Historic Structures Report, Part II (Portion), Architectural Data Section, Structural Rehabilitation of Old City Hall, Independence

Subject report has been reviewed and is hereby approved as of this date.

M. O. Anderson
Superintendent

In duplicate

cc:
Chief, RODC
Memorandum

To: Regional Director, Northeast Region

From: Chief Architect, EODC

Subject: Historic Structures Report, Part II (Portion), Architectural Data Section, Structural Rehabilitation of Old City Hall, Independence

Enclosed are two copies of the subject report for your review and distribution. This report, prepared by Architect Nelson, includes structural recommendations by Consulting Engineer Sheldon A. Keast.

By copy of this memorandum, a copy of this report is being sent to the Superintendent for his comments.

We will appreciate your early consideration of this report.

Enclosure (in duplicate)

cc:
Mr. Keast w/copy of report
Assistant Director, Design and Construction
Superintendent, Independence w/copy of report
Architect Nelson w/copy of report
HISTORIC STRUCTURES REPORT

PART II (Portion)

ON

OLD CITY HALL

Structural Rehabilitation

APPROVAL SHEET

RECOMMENDED

Superintendent

Robert G. Hall
Chief, EODC

By: [Signature] Acting Chief, EODC

Date 5-6-63

Regional Director, Northeast Region

APPROVED

Director
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FOREWORD

It should be explained at the outset that this report deals only with the proposed structural rehabilitation of Old City Hall. A supplement to this report will deal with the restoration of the interior and exterior architectural features.

Structurally, Old City Hall is the least complicated building on Independence Square. Fortunately most of the original structure (1790-91) has survived except for two attic trusses and a portion of the attic floor and roof framing which was replaced immediately following the fire of 1823. No other changes to the attic structure or to the second floor framing are known to have been made until the 1921-22 restoration, carried out under the direction of the Philadelphia Chapter of the American Institute of Architects. There is no need to remove or alter these structural improvements but there is a definite need to supplement them, and that is the essence of the proposed structural rehabilitation.

The existing structural conditions were recorded on a fine set of measured drawings prepared by an excellent team of Student Architects in the summer of 1960. This includes floor plans, measured drawings of the attic trusses, attic
floor and roof framing plans, and structural details including some of the rather unusual framing devices to be found in Old City Hall that are original with the building. Several of these drawings are reproduced in Appendix II.

Lee H. Nelson
Architect
May 1963
MASONRY WALLS

Basically the structural systems used at Old City Hall were typical of the period.

The exterior load bearing masonry walls are of solid brick about 2' thick. The bricks are hard burned and the mortar seems to be firm. There is no evidence of settlement. It will not be necessary to reinforce the walls as they are more than adequate to carry the additional weight of the proposed steel reinforcement for the attic structural system.

The first floor is carried by a network of floor joists supported by the outside walls and interior masonry walls and/or piers in the cellar, all of which are in good condition.

One masonry cross-wall extends up to the second floor level. On the first floor this cross-wall separates the open Stairhall and Treasurer's Office from the Mayor's Court Room. This cross-wall was largely rebuilt during the 1921-22 restoration and is in excellent condition.

SECOND FLOOR WALL TRUSS

The most interesting device on the second floor is the structural partition or "wall truss" which also serves as the north wall of the Common Council Chamber. The wall truss (which
is original) bridges the entire width of the building, that is, a clear span of 46' (between the outside masonry walls) to provide unobstructed space in the Mayor's Court Room below.

The wall truss per se was not new to the field of building construction in 1790-91. It was included in most eighteenth century architectural books and was also illustrated in the Carpenter's Company Rule Book of 1786 (see Illustration No. 1). It was possible to place door openings between the panel points and still have diagonal members in the truss.

This particular truss had sagged to a rather alarming degree by the twentieth century. The A.I.A. introduced steel girders at the attic level with iron tension rods supporting the strengthened second floor girders thus relieving the wall truss of its loads (see Illustration No. 8). No additional work will be necessary to reinforce this preserved wall truss.

**FLOOR GIRDERS**

The second floor joists are framed to a pair of 8-1/2 x 17" wooden floor girders. These girders span from the 3rd points on the wall truss (mentioned above) to points on the south outside masonry wall on each side of the "octagon" bay. These girders are not parallel with the building. During the A.I.A. restoration of 1921-22 these wooden girders were reinforced with steel wide flange beams and no additional reinforcement is necessary.
ATTIC FLOOR AND ROOF FRAMING

The roof framing system is typical for a large building with a hipped roof. Five wooden trusses provide the primary structural support for the attic floor, roof and cupola. Three of the trusses are original though badly charred from the 1823 fire. The two southernmost trusses were so badly damaged during that fire that they required replacement and date from the 1823 repair work (see Illustration No. 4). These trusses were intended to be self supporting with a clear span of about 46 feet. The truss spacing is not constant but varies from 7'-10" to 9'-10", to accommodate the stairway, chimneys and cupola. The truss joints are mortised and tenoned with some joints supplemented with iron "U" straps used on the vertical tension members.

The truss at each end of the building is a simple queen-post truss with the queen-posts especially adapted to support the hip rafters (see Illustration No. 5).

The three middle trusses are basically two trusses in one, that is, a queen-post truss with major roof rafters placed in line with the truss and fitted with a king post (at the ridge) which in turn tied into the top chord of the queen-post truss. The total height of these trusses is about 14'-6". All trusses need strengthening as do many of the rafters.
The three middle trusses were further burdened by having the entire load of the cupola placed on the top chord. Two of these trusses were fire charred in 1823 but still carry their original loads. The third was replaced after the fire (see Illustration No. 3).

Wood purlins span between the main rafters and hip rafters to carry the minor roof rafters. Many of the purlins are in bad condition.

**CUPOLA FRAMING**

The eight vertical cupola posts rest on wooden girders which in turn rest on the top chord of the three middle trusses. These trusses should be reinforced to eliminate the bending in the top chords and the eight cupola posts should be cross braced against wind loads.

The 1961 summer student measuring program furnished us with much information on the structural condition of Old City Hall. On the basis of that information, Mr. Sheldon A. Keast, consulting engineer for the Rehabilitation of Congress Hall and Independence Hall was called in to make a more precise evaluation of the structural condition of this building and to make recommendations for repairs. Mr. Keast's report was submitted on 18 September 1961. At his request, additional information was made available by opening up new
areas of plaster and he submitted a revised report which is dated 16 April 1963. While the condition of Old City Hall is not as serious as that at Congress Hall and Independence Hall there are some conditions that require attention in the very near future.

The southernmost attic truss for example has not only deflected excessively but is severely twisted (see Illustration No. 4). On this account temporary wooden posts have been installed underneath this truss at the panel points to prevent further deflection and possible failure.

RECOMMENDATIONS FOR STRUCTURAL REPAIRS

The Keast proposal is a comprehensive and well engineered plan for structural rehabilitation of the building with a minimum of disturbance to the old framing. As consulting engineer Mr. Keast feels that the remedial work will not be nearly as extensive as that required in Independence Hall but is urgently needed and will include the entire attic.

We recommend that the Ewing Report be abandoned for this building as it was for Congress Hall and Independence Hall. Study of that engineering report shows that it calls for needlessly drastic measures at Old City Hall. If followed the building would be gutted throughout including removal of all face bricks, strengthening of the outside walls, demolition of the roof and all attic framing members and complete reconstruction of the
entire interior of the building. This is incompatible with the National Park Service preservation policy and is structurally unnecessary. We recommend that the Keast proposal be adopted and carried into effect. By and large this structural rehabilitation can be carried out while still leaving the building open to the public.

**COST ESTIMATE FOR STRUCTURAL REPAIRS**

The extent of the work proposed includes fabrication of structural steel, delivery and erection, shoring, scaffolding, alteration to existing wooden members, cutting holes in roof for insertion of steel, patching roof and including reinforcements to the cupola and second floor framing. The estimated cost is $80,000.00. It should be emphasized that this work covers only the structural repairs and in no way includes architectural restoration of interior features which will be done at a later date. The necessary architectural research to cover this later phase of restoration will be covered in a supplement to this report.
APPENDIX I

September 18, 1961

Revised - April 16, 1963

Superintendent
Independence National Historical Park
420 Chestnut Street
Philadelphia 6, Pa.

Re: Repairs to Old City Hall

Dear Sir:

I have inspected the roof and ceiling supports of Old City Hall at Fifth & Chestnut Streets and submit herewith the following report:

At present, there are five trusses supporting the roof, cupola, and ceiling of the subject building. Truss No. 5 is in very bad condition, has about 5" of sag and is badly twisted. At Truss No. 4, on each side, is an existing 24" or 26" beam supporting the second floor construction by means of rods hanging from 8" channels framing on top of the girders. These beams do not, at present, support the roof. Truss No. 3 supports the cupola, and the top chord has been badly damaged by fire. This truss has no carrying partition below running directly to the basement, and carries the roof and ceiling on the full span across the building. Truss No. 2, adjacent to the stairway, is out of plumb; as is, also, Truss No. 1. Trusses No. 1 and 2 rest on a partition below,
which is carried on a brick wall running to the basement, but this partition does not occur at panel points of the trusses. The corridor partitions below these trusses have approximately a 2" bow in the height, as well as a horizontal bow. The ceiling rafters are mortised into the bottom chords of the trusses, and some have shrunk considerably, leaving as much as 1/2 inch between the ends and the chords. Some of the purlins supporting the roof rafters have sagged, and many have been damaged by fire.

I recommend the following repairs be made to the building:

1. In reference to the support of Truss No. 5, a 24 WF beam to be placed north of the truss and 16 WF beams from the new girder to the rear wall. This will provide adequate support for the truss, roof rafters, and dormer window. This is shown on the plan showing repairs to roof, marked Drawing No. 1. I also suggest supporting the ceiling rafters at the dormer window by a transverse 16 WF beam, with posts and hangers as shown on this drawing.

2. Existing 24" and 26" steel beams in the vicinity of Truss No. 4 supports the second floor. I recommend these beams be used to support the roof and ceiling. The 24" beam should be reinforced with plates bolted top and bottom, as shown on Drawing No. 1. The 26" beam is sufficiently strong to support this additional load.

3. In order to support Truss No. 3, which has been badly damaged by fire and is carrying most of the cupola, I recommend an
additional 24" WF beam be placed to the south of Truss No. 2, hanging and posting it from 8" channels supported on this 24" WF and the present 24" WF beam, which will be reinforced as recommended in No. 2. Truss No. 2 can be supported on the west end by cantilevering the channels. See Drawing No. 1.

4. While the Trusses Nos. 1 and 2 are partially supported on the partitions below, the support does not come at panel points and would throw bending in the bottom chords. I do not recommend that these partitions be used for this purpose, as the roof was originally designed to be supported by trusses and because of the age and inadequacy of the partitions below. I recommend that a 24 WF beam be placed north of Truss No. 1 and the chimney on the northeast so that Trusses Nos. 1 and 2 can then be supported by channels or beams framing from steel beam to steel beam. This beam will be supported on a grillage beam running across the head of the window and be supported by the aforementioned chimney on the south side. This chimney is, at present, temporarily shored in the first floor and should be rebuilt to form an adequate pier at the north end to support this load.

The advantage of adding this additional beam is that it will form a grid of beams to which adequate supports can be made to the roof rafters and purlins, some of which have sagged;
and, also, the ceiling beams, which can be picked up and adequately supported. Another advantage is that, in the future, if any repairs may be necessary, they can easily be done by supporting directly on these steel girders.

The ceiling rafters should be hung with iron straps from their supports, and some of the roof rafters need reinforcing and additional supports.

I also recommend additional steel bracing to reduce the bending in the top chords of Trusses No. 2, 3, and 4 caused by the weight of the cupola. Steel cross-bracing should be added to stiffen the eight cupola posts.

I have examined the second floor framing at the south end after the flooring was removed for inspection and find this framing adequate to support the second floor loads.

I recommend that this building be adequately repaired as soon as possible, as suggested above and as shown on Drawing No. 1, so that it will last for many years with a minimum of future repairs and maintenance.

Respectfully submitted,

SHELDON A. KEAST
ILLUSTRATION NO. 1

This Plate illustrates typical structural partitions (or wall trusses) used in the eighteenth century. These two examples, varying only in the size of their members, are listed as capable of spanning 22 and 25 feet respectively. Note that the framing is arranged to accommodate a door opening. In the case of Old City Hall, the wall truss spans 46 feet and is divided into additional "panel points" with extra vertical and diagonal members thus creating a five-panel truss with three door openings.


HABS Copy Photo
From 20 to 30 feet square.

22 Feet

25 Feet
at 30 feet square.
ILLUSTRATION NO. 2

This view shows the fireplace in the Treasurer's Office, northeast corner, first floor, after architectural investigation in 1961. This fireplace was considerably modified in the 19th century and converted into a niche. The fireplace should be rebuilt not only as an architectural feature, but to provide adequate structural support for the second floor fireplace and chimney and to carry the additional weight of the steel girder north of truss No. 1 (See Keast's drawing No. 1) which is planned as a part of the structural rehabilitation of the attic floor and roof framing.

Photo: Jack E. Boucher, 10 February 1961
Neg. No. E0DC 1184
ILLUSTRATION NO. 3

View of upper portion of attic truss No. 2.

Note extensive charred condition resulting from 1823 fire. Despite the charring of this truss and the noticeable shrinkage particularly at the king post, this truss is carrying not only the attic floor loads but one third of the weight of the Cupola. This truss has never been supplemented structurally to compensate for its weakened condition as a result of the 1823 fire. Furthermore the Cupola loads are carried on the horizontal chord member of the truss introducing high bending in the chord without any supplementary structural members to provide additional panel points in the truss.

Photo: Theodore F. Dillon, 19 August 1960
Neg. No. EODC 1195
ILLUSTRATION NO. 4

General view of Attic Truss No. 5 (rebuilt after 1823 fire).

Note excessive twisting in truss. Lower chord of truss has about a 5" sag; upper chord of truss has about a 4" twist and the one queen post of the truss is about 8" out of plumb. Unfortunately, remedial measures (note long diagonal) have damaged truss rather than helped it, because the diagonal load is carried into the lower chord about 3 feet from the wall.

It is planned to retain all the old trusses in the structural rehabilitation by supplementing them with steel girders spanning the masonry walls and hanging and/or posting the floor and ceiling loads where required.

Photo: Theodore F. Dillon, 19 August 1960
Neg. No. EODC 1198
ILLUSTRATION NO. 5

Joint detail Attic Truss No. 2.

Note extensive charring from 1823 fire. Also note severe checking in all members probably as a result of water damage during the fire. This unusual connection shows the queen post, top chord, and diagonal chord supporting a major roof rafter. There is no connection between the queen post and the major rafter but the queen post does relieve the rafter of deflection owing to its long span.

Photo: Jack E. Boucher, February 1961
Neg. No. EODC 1378
ILLUSTRATION NO. 6

Joint detail, Attic Truss No. 1.

Note connection between queen post and lower chord. This is basically a mortise and tenon joint but supplemented with iron U-straps and a system of iron wedges. Note shallow attic floor joists, many of which have shrunk away and have technically failed in shear or bending. The attic floor system is supplemented with diagonal floor beams visible at left which frame into lower chords of truss (never at panel points). Note excessive checking in diagonal floor beam and lower chord of truss. All such attic floor joists and floor beams connections should be supplemented with steel hangers.

Photo: Theodore F. Dillon, 19 August 1960
Neg. No. EODC 1200
ILLUSTRATION NO. 7

View looking into northeast corner of attic showing hip-roof framing and attic floor framing. Note particularly the extensive fire charring on the hip rafter and secondary rafters. The rafters are structurally inadequate due to their small cross-section and long spans. Some of the rafters have actually failed and have been temporarily propped up.

Fortunately most of the attic floor joists were not heavily fire charred because of the floor boards which existed at the time of the fire. However, most of the attic floor joists are inadequately secured to the major framing members.

The masonry fire wall visible around the perimeter was added in the 1920's, as was the gypsum plank used for roof sheathing.

A new network of steel girders and steel secondary members will permit posting or hanging of all the critical points in the attic and will provide the necessary framework for future repair work as it becomes necessary.

Photo: Jack E. Boucher, February 1961
Neg. No. EODC 1387
Visible in the foreground is one of the 24 and 26 inch steel girders (at truss No. 4) that was installed in the restoration carried out under the direction of the Philadelphia Chapter of the American Institute of Architects in the early 1920's. These two steel girders were designed to provide structural support for the original wooden wall truss at the second floor level. This wooden wall truss in turn carried major second floor beams. The entire second floor structural system was strengthened at this time and carried from above. Note the double pairs of channels which span between the steel girders. From these channels the second floor wall truss is supported with hanger rods. It is intended to strengthen the 24" wide flange beam so as to carry the additional roof loads. Basically the limited structural work carried out in the 1920's was of sound design and the proposed structural rehabilitation is merely an extension of that work.

Photo: Theodore F. Dillon, 19 August 1960
Neg. No. EODC 1196
ALL TRUSSES SHOWN AT NORTH ELEVATION