“Draft” Interim Report

On:

Cursory Structural Review of Province House Charlottetown, PEI

For:

Parks Canada
Historic Properties
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1.0 Introduction

In general, the scope of services to be provided by J.W. Cowie Engineering Ltd. (Cowie Engineering) is to conduct a cursory structural review and visual inspection of the entire building for signs of potential structural and/or safety issues at Province House. Cowie Engineering is also to review and assess drawings, reports and other relevant documents provided to Cowie Engineering by Parks Canada.

In addition to the above, the Cowie Engineering work included the implementation of temporary strengthening and stabilization of; (a). the timber floor framing of the Speaker's Office, (b). the brick masonry arch of the masonry vault occupied by the Sprinkler Room in the basement (directly below the Speaker's Office and for support of the Speaker's Office floor) and (c). temporary support for the first floor timber beams presently supported by defective clay brick masonry columns located at the Southeast area of the basement.

With exception of isolated areas of the first floor framing observed from within the basement, most of the first floor timber framing and all of the second and third floor timber framing is concealed by ceiling finishes. Most of the timber roof framing is concealed by glass fibre batt insulation.

Other than a small floor area adjacent to the first floor Southwest exit, no original design drawings or "as built" original construction drawings or restoration design drawings can be found for the first floor framing, second floor framing or third floor framing. There are drawings of the original timber roof framing however, all details are not included. There are also limited restoration design drawings of the roof framing.

During the J.W. Cowie (Cowie) site visit of 20th to 22nd March 2014, the floor of the Speaker's Office and other areas were opened up by McGuirk Bros. Construction Ltd. The Speaker's Office floor had to be temporarily strengthened and stabilized and the office ready for reoccupancy by the morning of 24 October 2014. Due to time constraints, Cowie provided oral instructions to McGuirk Bros. Construction during the dismantling and provided details for the temporary strengthening and stabilization. The details of the "as found" construction and "temporary strengthening" details for the Speaker's Office floor, "shoring" the brick masonry arch roof of the Sprinkler Room below and the temporary shoring of the timber first floor beams in Rooms; B13, B14 and B15 are included in this report.

The following areas of the building have been reviewed:

1. Speaker's Office floor (103) and clay brick masonry arch roof of the brick masonry vault below presently serving as the Sprinkler Room.

2. Deteriorated brick masonry columns in the Southeast basement area (Rooms; B13, B14 and B15).

3. General review and discussion regarding the deteriorated clay bricks and deteriorated "Island" sandstone throughout the basement.

4. Timber roof framing.

5. Deflected floor of West gallery of Legislative Assembly Room.

6. Deflected floor of East gallery of Confederation Room.

7. Displaced sandstone units of sandstone masonry arches of the North and South porticos.

Concern Regarding Concealed Brick Masonry and Concealed Timber Framing

Observations of the visible brick masonry within the basement revealed deteriorated clay bricks and extensive demolition damage to the brick masonry by the plumbers and electricians. The plumbers and electricians punctured numerous holes in the clay brick masonry arch roof of the Sprinkler Room as well as damaged the brick masonry columns in Rooms; B13 to B15.

There is concern if the plumbers and electricians ran their pipes and conduit through other masonry components, in all likelihood, similar damage has occurred.

There is also concern that if the plumbers and electricians had little regard for the structural integrity of the brickwork that most likely the plumbers and electricians caused damage to the timber floor joists.

It is recommended where major plumbing pipes and electrical conduits run and the areas concealed with wall and ceiling finishes, that (where and when possible) the finishes be removed to expose the structural elements that the pipes and electrical conduits pass through. If, structural defects and/or damage is observed, it is recommended temporary strengthening/shoring be installed. In all likelihood, this investigation could be done throughout the basement without disturbing the occupants of the building.

To date, no original design drawings or “as built” drawings of original construction or “as built” restoration design or construction drawings can be found for the first floor. Modifications appear to have been made to the basement area since initial construction. In the interest of establishing the “as built” structural support system for the first floor and whether or not there are any significant structural issues, it is recommended sufficient finishes be removed to reveal the structural support system. The structural support system for the first floor should be documented and a structural floor plan prepared. If there are any structural defects, it is recommended temporary strengthening/shoring be installed.

Roof Framing

For the most part, the roof framing is concealed by glass fibre batt insulation consequently, Cowie only made limited visual observation of the roof framing. Cowie

however, did observe instances where the roof framing is severely cracked and in one instance where a roof rafter is in imminent danger of shear failure and collapse.

If the defects observed by Cowie are representative of the timber framed construction throughout the roof, it is recommended the glass fibre batt insulation be removed from the underside of the roof framing, a detailed inspection and documentation be made of the roof framing. Where defects/damage is detected, temporary strengthening/shoring should be implemented. This work could be done without disturbing the occupants of the building.

Next Phase of On-Site Inspections

It is suggested after Parks Canada representatives have had an opportunity to review this report that Cowie and Parks Canada representatives meet and discuss the next phase of Cowie's work.

2.0 Defective Structural Support of Speaker's Office Floor and Damaged Clay Brick Masonry Arch Roof of Sprinkler Room Below

2.1 Defective Timber Floor Construction of Speaker's Office

On 20 and 21 March 2014, the timber floor deck throughout the Western half of the Speaker's Office was removed to enable inspection and documentation of the structural system supporting the floor of the Speaker's Office. The removed deck consisted of two layers of ¾ in. thick timber boards, a layer of 3/8 in. thick plywood covered with approximately ¼ in. thick wood underlay. The wood underlay was covered with carpet.

It is understood, the original timber floor deck was replaced with the above floor deck construction during the extensive restoration work of the 1980's.

Removal of the floor deck exposed the original East/West spanning 3 in. wide x 4 in. deep timber "sleepers" located at approximately 16 in. centre to centre. (Refer to Figure 1 "Plan – Existing Speaker's Office Floor (Room 103), Appendix "A", Volume I and Photograph RS-1, Appendix "B", Volume II).

The East end of the timber "sleepers" are supported on the top of the brick masonry arch of the vault below. (Sprinkler Room/Room B02). (Refer to Figure 2 "Existing Section Through Speaker's Office Floor Including Supporting Arched Roof of Brick Masonry Vault Below (Sprinkler Room), Appendix "A", Volume I and Photograph RS-2, Appendix "B", Volume II).

The West end of the timber "sleepers" are supported on top of a North/South spanning 7 ½ in. x 14 in. deep timber beam located adjacent to the West stone masonry foundation wall of the building. (Refer to Figure 2, Appendix "A" and Photographs; RS-19 to RS-21, Appendix "B", Volume II).

Approximately 50% of the depth of the timber beam has deteriorated from wood rot. (Refer to Photographs; RS-14 and RS-15, Appendix “B”, Volume II). There however was no evidence of deterioration to the original timber “sleepers” nor any evidence of deterioration to the wood deck installed during the 1980’s.

2.2 Damaged Arch Roof of Clay Brick Masonry Vault Supporting the Floor of the Speaker’s Office

The arch shape roof (depressed arch/segmental arch) of the clay brick masonry vault located below the Speaker’s Office supports the floor of the Speaker’s Office. (Room 103). The vault is located in the basement and serves as the Sprinkler Room (Room B02). (Refer to Figure 2, Appendix “A”).

Subsequent to initial construction, holes were punched through the roof of the masonry arch of the vault. The punched holes have significantly reduced the strength and stability of the brick masonry arch roof. It appears many of the holes were made by plumbers and electricians to facilitate the installation of piping and electrical conduit.

The West side of the arch roof of the vault has been severely weakened by the presence of six puncture holes. The location and size of the punched holes can be found in Figure 5, “Plan – Location of Puncture Holes in Brick Masonry Arch Supporting the Speaker’s Office Floor” found in Volume I. Photographs were taken of the holes. (Refer to Photographs; RS-6 to RS-12, RS-16 to RS-18, Appendix “B”, Volume II).

A hole (Hole 7) also exists in the brick masonry arch adjacent to and below the North window. (Refer to Figure 5, Appendix “A”, Volume I and Photograph RS-37, Appendix “B”, Volume II).

A horizontal slot (pipe chase) exists near the East base of the brick masonry arch adjacent to the North end of the brick masonry vault. The slot extends through the base of the brick masonry arch to Room B03. The slot is indicated as Hole Location 8 in Figure 5, Appendix “A”, Volume I. (Also refer to Photographs; RS-38 and RS-39, Appendix “B”, Volume II). It would appear the pipe chase existed at the time of initial construction.

2.3 Temporary Shoring Arch Roof of Clay Brick Masonry Vault (Sprinkler Room/Room B02)

On 21 March 2014, two timber spreader beams 6 in. x 6 in. (nominal) supported by adjustable steel shores (“jack posts”) were installed along the underside of the arch shape vault roof. (Refer to Figure 3 “Plan – Temporary Structural Support of Speaker’s Office Floor” and Figure 4 “Section Showing Strengthening of Timber “Sleepers” and Shoring of Rotten Timber Beam of Speaker’s Office Floor and Shoring of Arched Roof of Brick Masonry Vault Below (Sprinkler Room)”. These Figures can be found in

Appendix “A”, Volume I. Also refer to Photographs; RS-31 and RS-32, Appendix “B”, Volume II).

2.4 Temporarily Stabilizing the Speaker’s Office Floor

A steel shore (“jack post”) was placed under the deteriorated (rotten) 7 ½ in. x 14 in. North/South spanning timber beam. In addition, four of the East/West spanning “sleepers” were strengthened by anchorage of a 4 in. x 4 in. x 3/8 in. steel angle to the 4 in. vertical face of each “sleeper”. At the East end of each angle, the horizontal leg bears on top of the brick masonry arch of the vault while at the West end, the horizontal leg of each angle bears on top of the sandstone exterior masonry wall. (Refer to Figure 3 “Plan – Temporary Structural Support of Speaker’s Office Floor”, Appendix “A”, Volume I and Photographs RS-25 to RS-28, Appendix “B”, Volume II).

2.5 Temporary Replacement of Floor Deck

The demolished 1980’s floor deck was replaced with two layers of ¾ in. thick plywood, and one layer of ½ in. plywood. (Refer to Photograph RS-29, Appendix “B”, Volume II).

2.6 Permanent Restoration Construction of the Brick Masonry Arch Roof of the Vault and Floor of the Speaker’s Office

At the time of permanent restoration, most of the floor deck throughout the Speaker’s Office floor will have to be removed in order to implement restoration construction of the clay brick masonry arch of the vault below.

The existing rotten timber beam will have to removed and replaced with a new pressure treated beam or new masonry wall construction.

The 7 ¼ in. x 14 in. timber beam in question most likely deteriorated by wood rot because of the presence of moisture and the area not vented. In all likelihood, the bottom portion of the timber beam was buried in rubble.

In order to prepare restoration design details it will be necessary to remove the existing floor decking at the North end of the Speaker’s Office and remove the damaged/deteriorated timber stud wall at the North end of the Sprinkler Room. Prior to restoring the brick masonry arch ceiling of the Sprinkler Room, it is recommended a review be made of the sprinkler equipment and piping as, proper openings within the brick masonry arch roof will have to be made. In addition, some of the piping serving the hot water radiation may have to be rerouted.

For fire protection purposes, the sprinkler system should remain operational during all restoration work.

2.7 Sprinkler Room Issues

The Sprinkler Room requires significant cleaning. The debris from the holes in the brick masonry arch roof of the vault should be removed. In addition, all combustible debris should be removed.

The temporary plywood enclosure of the basement window is not tight fitting and permits rainwater entry. The holes for the passage of piping are also open allowing rainwater entry. (Refer to Photograph RS-36, Appendix “B”, Volume II). Portions of the stone masonry arch over the window opening have collapsed.

It is recommended the stone masonry arch over the window opening be restored and the window reinstalled. In order to prepare restoration design details for permanent restoration, it will be necessary to conduct a detailed inspection and subsequent documentation of this area.

3.0 Defective and Damaged Clay Brick Masonry Columns at Southeast Area of Basement Rooms; B13, B14 and B15

3.1 Brick Masonry Column 1b, Basement Room B15

The brick masonry Column 1b is located adjacent to the South exterior wall of Basement Room B15. (Refer to Figure 6 “Southeast Basement Area, Rooms; B13 to B15”, Appendix “A”, Volume I). The brick masonry column has plan dimensions of 1 ft. 1 ¼ in. (+/-) by 2 ft. 2 ½ in. (+/-).

The clay bricks within the bottom portion of the column (extending approximately 3 ft. above the concrete floor level) have deteriorated. (Refer to Photographs; BSE-1 to BSE-5, Appendix “B”, Volume II).

Clay bricks at the bottom portion of the column have lost significant strength. By simply rubbing the face of the bricks, sections of the clay brick are easily removed. Without removing any brick masonry material, the minimum “out to out” dimensions of the bottom portion of the column measures 8 ½ in. x 1 ft. 10 in.

As a consequence of the brick deterioration, the bottom portion of the column has lost approximately 47% of its original cross sectional area.

At the top of the column, a 6 in. deep x 12 ½ in. high section of brick masonry has been cut out across the North face of the column. (Refer to Photograph BSE-6, Appendix “B”, Volume II).

A North/South spanning 7 ¼ in. wide x 1 ft. 2 in. deep timber beam is bearing on the top of the brick masonry Column. It appears a 2 in. x 10 in. (nominal) timber joist is connected to each side of the East and West faces of the beam. Removal of a section of the ½ in. thick gypsum board sheathing at the underside of the timber beam

adjacent to North face of the column revealed extensive wood rot near the Southern end of the beam. (Refer to Photographs; BSE-7 and BSE-8, Appendix “B”, Volume II).

In the interest of safety, an adjustable steel shore (“jack post”) was installed for support of the timber beam. (Refer to Photograph BSE-9, Appendix “B”, Volume II).

At the time of permanent restoration, it was recommended the deteriorated brick masonry column be replaced with a new brick masonry column and a detailed inspection be made of the 7 ¼ in. x 1 ft. 2 in. timber beam to determine the extent of required restoration.

3.2 Brick Masonry Column 2a, Basement Room B14

Brick masonry Column 2a is located at the Southwest corner of Basement Room B14. (Refer to Figure 6 “Southeast Basement Area, Rooms; B13, B14 and B15”, Appendix “A”, Volume I).

The plan section of the brick masonry column has dimensions 1 ft. 5 ¼ in. (North/South by approximately 1 ft. ½ in.) (East/West). The West face of the brick masonry column is built against the North/South spanning “Island” sandstone masonry bearing wall. The brick masonry column is not composite with the “Island” sandstone bearing wall.

Structural Damage

The South upper portion of the column has been demolished to enable the installation of electrical conduit. (Refer to Photographs; BSE-10, BSE-11, Appendix “B”, Volume II and Figure SK-7 “East Elevation of Damaged Brick Masonry Column 2a, Southwest Corner of Basement Room B14”, Appendix “A”, Volume I). Approximately 40% of the plan bearing area of the column has been demolished.

The column supports two East/West spanning timber beams. (a 6 ¼ in. wide x 12 in. deep beam and a 3 in. wide x 12 in. deep beam). The beams are separated by approximately 3/8 in. and do not appear to be connected to permit composite action. The centre of gravity of the 6 ¼ in. wide beam is located on the edge of the demolished section of brickwork.

Installation of Temporary Shoring

Recognizing that; (a). 40% of the cross sectional plan area of the column is demolished, (b). not knowing the engineering characteristics of the brick masonry and (c). the centre of gravity of the 6 ¼ in. x 12 in. timber beam is located at the edge of the demolished opening, the decision was made to install an adjustable steel shore (“jack post”) to provide additional support for the 6 ¼ in. x 12 in. timber beam.

Permanent Restoration

It is recommended the electrical conduit be relocated and the brick masonry construction be restored.

3.3 Brick Masonry Column 2c, Basement Room B14

The brick masonry Column 2c is located North of the brick masonry Column 2a found at the Southwest corner of the Basement Room B14. (Refer to Figure 6 “South Basement Area, Rooms; B13, B14 and B15”, Appendix “A”, Volume I. Also refer to Photographs; BSE-12 to BSE-15, Appendix “B”, Volume II).

The width of the East face of the column measures 1 ft. 5 ½ in., the South face 1 ft. 1 in. and the North face 9 in. The West face of the column is built against the North/South spanning “Island” sandstone bearing wall.

Subsequent to initial construction of brick masonry column, a North/South horizontal hole was drilled through the brick masonry column. (Refer to Figures; 8 to 10, Appendix “A”, Volume I).

The brick masonry column supports an East/West spanning timber beam. The timber beam is bearing on a 2 in. x 4 in. (actual) member placed along the East top edge of the column. (Refer to Figure 10, Appendix “A”, Volume I). The centerline of the North/ South spanning timber beam is located approximately 6 in. from the North face of the column. The beam reaction therefore has an eccentricity of approximately 2 ¾ in. from centerline of the North/South dimension of the column and approximately 3 ½ in. eccentricity from the centerline of the column in the East/West direction.

The column has been substantially weakened by the impact hammering making the hole for the pipe.

Recognizing the eccentric loading on the column and the damage to the column, a decision was made to install a steel shore (“jack post”) to support the West end of the timber beam.

Restoration

Further investigation is required to determine the reaction loads on the beam, the condition of the timber beam and the quality of the brickwork. The column could be restored by removal of the brickwork, disconnecting the pipe, installing a pipe sleeve around the pipe at the column location and rebuilding the brick masonry column. The bearing condition for the beam should be improved.

3.4 Brick Masonry Column 3c, Basement Rooms; B13 and B14

Basement masonry Column 3c is located between Basement Columns; 3a and 3d. (Refer to Figure 6 “Southeast Basement Area, Rooms B13, B14 and B15”, Appendix

"A" and Photograph BSE-16, Appendix "B", Volume II). The plan dimensions of the column are 1 ft. 1 in. (North/South) x 1 ft. 5 ½ in. (East/West). The clay bricks of the column are deteriorated at both the top and bottom areas of the column. (Refer to Photographs; BSE-17 to BSE-21, Appendix "B", Volume II). As a consequence of the brick deterioration, the column has lost approximately 4 inches in affected bearing area (North/South) and approximately 3 in. (East/West). The column has lost approximately 45% of its effective cross sectional bearing area because of the deteriorated brickwork. Further loss of cross section could be easily made by rubbing the deteriorated bricks which causes a loss of fine clay material.

The column supports the timber beam spanning East/West. The timber beam is concealed by "plaster like" material containing expanded metal mesh.

An existing adjustable steel shore ("jack post") is located adjacent to the West face of the column and is used to provide support to the underside of the East/West spanning timber beam.

A decision was made to install an adjustable shore ("jack post") adjacent to the East face of the column for support of the timber beam spanning from Column 3c to Column 4c. This decision was made as a consequence of:

- Approximate loss of 40% of cross sectional area of the column.
- Very low strength of deteriorating bricks.
- The timber beam is most likely not a continuous beam but rather a simple span beam. This decision was made based upon on observations of the exposed timber beam bearing on the top of Column 3a.

3.5 Brick Masonry Column 3d, Basement Rooms; B13 and B14

Clay brick masonry Column 3d is the same size as brick masonry Column 3c and has undergone similar deterioration. As with Column 3c, approximately 45% of the cross sectional area of Column 3d has been lost due to brick deterioration. As a consequence of the cross sectional area loss and low strength bricks, a decision was made to place an adjustable "jack post" adjacent to the East face of the column for support of the East/West timber spanning beam. (Refer to Figure 6, Appendix "A" and Photographs; BSE-23 to BSE-26, Appendix "B", Volume II).

3.6 Clay Brick Masonry Column 4a, Basement Room B13

Brick masonry Column 4a is located at the Southeast corner of Basement Room B13. (Refer to Photograph BSE-27, Appendix "B", Volume II). The plan dimensions of the brick masonry column are 1ft. 0 in. to 1 ft. ½ in. (North/ South) to 1 ft. 4 ½ in. to 1 ft. 5 in. (East/West). The brickwork of the column is distorted and the column is out of plumb. The column appears to have replaced an original brick masonry column. The

quality of workmanship construction of the column is very poor and does not represent the work of a qualified brick mason.

The column supports two East/West spanning timber beams. (One 6 ¼ in. x 12 in. and one 3 in. x 12 in. beam).

The timber beams appear to be bearing on slate shingles at the top of the masonry column. (Refer to Photographs; BSE-28 and BSE-29, Appendix “B”, Volume II).

As a consequence of the distorted, out of plumb column, excessively wide mortar joints and overall questionable quality of brickwork, the decision was made to place an adjustable steel shore (“jack post”) adjacent to the West face of the column for support of the timber beams.

3.7 Water Leakage in Basement Window, Room B14

There has been a history of water leakage through the basement window opening located at the Southwest corner of Basement Room B14. The original basement window has been temporarily replaced with a sheet of plywood. The sheet of plywood is not fitted tightly around the window opening and two PVC conduits pass through the plywood sheathing. (Refer to Photographs BSE-30 and BSE-31, Appendix “B”, Volume II).

In all likelihood, the recent water leakage is a direct result of piling snow adjacent to the South side of the building. (Refer to Photographs; BSE-32 and BSE-33, Appendix “B”, Volume II).

4.0 Deteriorated Clay Bricks and Deteriorated “Island” Sandstone Throughout Basement

Clay bricks have deteriorated throughout the basement however the locations of the deteriorated brick are not consistent. The clay bricks have deteriorated at the bottom of clay masonry columns as well as at the top of clay brick masonry columns. In some areas, there is no evidence of deterioration to the clay bricks.

In all likelihood, there is wide spread variation in the initial quality of the clay bricks. Some bricks most likely were “fired” for a longer period of time than other bricks. The less time “fired” the less durable the bricks.

At various areas within the basement, the “Island” sandstone foundation walls have deteriorated. As with the deteriorated clay bricks, the faces of the deteriorated “Island” sandstone units when rubbed, will lose material. Opinions have been expressed that the “Island” sandstone is deteriorating due to the wetting and drying cycles causing the feldspars within the stone to expand. The extent to which the “Island” sandstone units have deteriorated has not been established.

There is evidence of water entering the basement window openings and there is likely at grade surface water permeating the stonework of the exterior masonry walls. With proper restoration of the windows, flashings and waterproofing details, water infiltration can be prevented from entering the exterior walls from grade.

There has been concern regarding elevation of the water table reaching the underside of the concrete basement floor slab and introducing dampness into the building. The elevation of the water table however, is unknown. It is understood, the sump pits in the tunnels at the East and West ends of the building are lower than the basement floor of Province House. It is further understood, the sump pits have never overflowed. It is possible there may not **now** be a water table issue.

The information regarding the ground water level within the sump pits of the tunnels leaves one to the conclusion that the water table at the East and West ends of the building have been drawn down lower than the basement floor of Province House. It however is possible the elevation of the water table at the central portion of the building may be higher than the East and West ends of the building.

To resolve the concern regarding the influence of the water table on the dampness within the basement, it is suggested a geotechnical engineering firm be retained to install bore holes (monitoring wells) adjacent to the North and South elevations of the central portion of the building and bore holes (monitoring wells) in the central portion of the basement. If, the elevation of the water table is of concern, it may be possible to lower the elevation of the water table by installing a drainage system around the perimeter of the building. The drainage should be located below the level of the foundations however, at a reasonable distance from the foundations to prevent undermining. Eliminating water entry into the basement would eliminate concern regarding the wicking of the water into the sandstone causing damage.

To establish the extent of the brickwork and stonework deterioration and obtain more information regarding elevation of the water table etc., the following is recommended:

1. Take representative samples of the deteriorated clay brick and representative samples of the nondeteriorated clay brick. The brick samples should be sent to a recognized testing lab for analysis including compressive strength, petro-graphic evaluation etc. The testing lab should have the appropriate certified equipment and qualified “Ceramic Engineers” on staff.

2. Core samples should be taken at representative areas of the deteriorated “Island” sandstone. The core samples should be sent to a testing lab for analysis to establish the progress of deterioration and the compressive strength of the “Island” sandstone.

3. Investigate and document the existing details of waterproofing the exterior foundation walls completely around the building including the location of footing drains related to the elevation of the bottom of the exterior foundation walls.

4. Establish the elevation of the ground water table. A geotechnical engineering firm should be retained to do this work. This would involve drilling bore holes (monitoring wells) and monitoring the level of the ground water table. In all likelihood, the elevation of the ground water table would be higher this year instead of a typical year because of the past history of rain and snow during the Winter 2013/2014.

5. If the elevation of the water table is above the bottom of the foundation walls, establish a method of drainage to lower the elevation of the water table under the building and adjacent to the building.

5.0 Timber Roof Framing

Investigation of the roof framing was limited to visual observations from the attic floor. Due to access problems and concealment, the lower portion of the sloped roof could not be observed from the attic.

Throughout the attic, the timber roof deck, the timber joists and top chord of the North/South spanning timber roof trusses are concealed by glass fibre batt insulation.

At the direction of J.W. Cowie, (Cowie), McGuirk Bros. Construction removed glass fibre batt insulation in three areas to expose the roof framing.

For convenience in reporting on the general locations of the Cowie observations refer to attached third floor architectural plan (Drawing A-11) of the “Temporary Stabilization and Selected Masonry Restoration” documents of the 2013 construction. (Refer to Appendix “A”, Volume I). The locations of the North/South spanning roof trusses are each given a gridline reference. The roof trusses are shown dotted on Drawing A-11.

The three areas of the roof inspected by Cowie are located on the South side of the corridor at roof trusses on Gridlines; 3 and 7 as well as a visual inspection of the central area above the corridor located near the roof truss on Gridline 5. Visual observations of these three areas revealed the following:

1. Strengthening of the Timber Roof Trusses During the 1980’s

Numerous new timber components were installed during the 1980’s. The new timber components are stained a green colour as a result of the preservative treatment. Sections were strengthened by the installation of bolted steel gusset plates etc. (Refer to Photographs; RF-1 and RF-2, Appendix “B”, Volume II).

At many of the restoration steel connections, the steel bolts pass through wide cracks within the timber components and many of the bolts have inadequate edge distance. (Refer to Photographs; RF-2 to RF-5, Appendix “B”, Volume II).

Restoration “as built” drawing “Main Truss Reinforcing”, Drawing 2-1 of January 1979 (refer to Appendix “A”, Volume I) shows the typical strengthening details for

the North/South spanning timber roof trusses. The details of the steel strengthening plates do not include specific reference to minimum required edge distances nor any restoration instructions regarding extensive cracking within the timber components.

2. **Structural Steel Beams Installed Over Rooms; 301 (Confederation Room) and Room 311 (Legislative Assembly Room)**

   "As Built" Drawing 2-1 "Main Truss Reinforcing" also shows the installation of two structural steel beams over Room 301 and two structural beams over Room 311. The steel beams are noted to be W18 x 55. The steel beam installation over the South side of Confederation Room is shown in Photograph RF-13, Appendix "B", Volume II. There are no drawings showing the connection details to the steel beams nor new bearing supports for the new steel beams.

3. **North/South Spanning Roof Rafters**

   Some of the original rafters (3 ½ in. deep x 4 in. wide) have been replaced by laminating three 2 in. x 4 in. (nominal) timber studs during the 1980's roof restoration. (Refer to Photograph RF-7, Appendix "B", Volume II). **At one probe location it was noted the North bearing end of an original 3 ½ in. x 4 in. roof rafter is failing at its bearing end. The notched end is splitting into the span of the rafter. Within time, collapse is imminent.** (Refer to Photograph RF-10, Appendix "B", Volume II). In all likelihood, there are other instances of failure at the bearing end of the original roof rafters.

4. **Water Leakage Staining**

   There are numerous instances of water leakage staining on the underside of the timber roof deck and adjacent timber framing. One of the areas of worst water staining was in the central roof area in the vicinity of roof truss on Gridline 5. (Refer to Photographs; RF-11 and RF-12, Appendix "B", Volume II).

Recommendations

Cowie's visual inspection although limited, may have detected typical problems throughout the roof framing.

In all likelihood, no additional "as built" drawings can be found regarding the extensive restoration of the roof framing during the 1980's. It is recommended the glass fibre batt insulation throughout the attic ceiling be removed to expose all the timber roof framing. Detailed inspections should be made of the timber roof framing and all suspected defects should be documented.

Where defects/damage is observed and there is a danger of failure, temporary strengthening/stabilization should be implemented.

Drawings should be developed incorporating the “as built” original construction and the “as built” 1980’s construction. Areas of suspected defects should be noted and recommendations for permanent restoration provided.

In all likelihood, the only realistic method of observing and documenting the condition of the existing roof framing near the lower ends of the roof slopes and adjacent to the exterior walls is by the removal of the timber roof deck. Past efforts to observe and document the roof framing adjacent to the exterior walls was by the removal of a portion of the ceiling finishes in the rooms below. Observing and documenting the roof framing through narrow openings in the ceiling finishes adjacent to the exterior walls was limited due to obstructions consequently, the preferred option for access is to remove the roof decking.

6.0 Deflected Gallery Floor of Legislative Assembly Room (311)

The floor of the gallery to the legislative assembly at its third floor entrance has undergone excessive deflection. (Refer to Photographs; GF-1 to GF-3, Appendix “B”, Volume II). The East side of the gallery floor has deflected 2 15/16 in. over a width of 3 ft. 7 in.

The gallery floor is not supported by cantilevered timber floor beams but rather it appears to be supported by simple span beams bearing on two columns below. (Refer to Photograph GF-4, Appendix “B”, Volume II). The original structural design drawings for this area of the building are not available nor are design or “as built” drawings of the 1980’s restoration construction available.

It is unknown whether or not any structural modifications were made in the 1980’s to prevent further deflection. There does not appear to have been any significant deflection since the restoration of the 1980’s as, there is no damage to the plaster wall and ceiling finishes below.

The cause of excessive floor deflection of the gallery is unknown. Two columns supporting the gallery floor appear to be located at approximately 18 ft. 6 in. centre to centre and bearing on the second floor framing. It is unknown how the two columns are supported by the second floor timber framing.

If a timber beam spans between the two columns, a deflection of approximately 3 in. is excessive and beyond what normally would be expected as a result of elastic and inelastic deflection (long term creep). At the time of measuring the floor deflection, there was no “live” loading on the floor consequently, the approximate 3 in. deflection is a result of “dead” load.

The excessive floor deflection may or may not represent a structural failure condition. In order to properly assess the structural capacity of the gallery floor requires observation and documentation of the “as built” structural framing for the gallery floor.

The excessive deflection of the gallery floor at its entry area causes instability in walking. Although a guardrail has been placed at the third floor entrance of the gallery, the gallery floor remains significantly off level North and South of this area. If the design drawings/“as built” drawings of the 1980’s restoration construction can be made available for review, this would be of assistance in determining the extent of future restoration construction.

Recommendations

At a convenient time to the occupants of the building, it is recommended the plaster ceiling at the underside of the floor of the gallery be opened up to observe and document the structural framing details. It is also recommended, the underside of the second floor framing be opened up to determine the bearing support conditions for the columns of the gallery floor.

7.0 Deflected Gallery Floor of Confederation Room (301)

The gallery floor on the East side of the Confederation Room has undergone a significant deflection similar to the deflected West gallery floor of the Legislative Assembly Room. As with the gallery floor of the Legislative Assembly Room, the gallery floor of the Confederation Room is supported by columns on each side of the East gallery floor entrance area from the third floor. (Refer to attached Photograph GF-5, Appendix “B”, Volume II).

The cause of the deflection is unknown as there is no cracking within the wall and ceiling finishes below. It is unknown if any structural restoration work was done in this area during the 1980’s. Unlike the gallery for the Legislative Assembly Room, the gallery of the Confederation Room is not open to the public. It is understood, there are no original design drawings, “as built” original construction drawings or restoration design drawings for the gallery area in question. As with the gallery floor of the Legislative Assembly Room, it is recommended the ceiling finish at the underside of the gallery floor be opened up to document the details of the existing construction. Also, the ceiling of the first floor should be opened up to observe the second floor construction to determine what is supporting the columns for the gallery.

8.0 Displaced Sandstone Units of Stone Masonry Arches of the North and South Porticos (Out of Plumb Columns and Spreading Arches)

The stone masonry arches are spreading and the supporting stone masonry columns are out of plumb. As a consequence, of the spreading of the arches, the individual stones have shifted. (Refer to South portico Photographs; SM-1 and SM-2 and also North portico Photographs; SM-5 and SM-6, Appendix “B”, Volume II).

The worst stone displacement occurs over the central arch of the South portico. In the interest of preventing further spreading of the arch and displacement of the individual stone units, a structural steel member was installed on the back side of the South central arch. (Refer to Photographs; SM-3 and SM-4, Appendix “B”, Volume II as well

as Cowie Engineering design Drawing S-1R of the “Temporary Stabilization and Selected Masonry Restoration” design drawings of June 2013).

The purpose of installing the structural steel member is to control the gravity loading on the arch and provide resistance to spreading.

It is understood, Parks Canada has been monitoring the stone displacements over a number of years and have reported no significant movements.

In all likelihood, the original design/construction of the arch did not take into account the lack of horizontal resistance offered by the abutments. The lower portion of the bed joints within the stone masonry columns, are not level. The columns are out of plumb. These rough measurements would indicate that possibly these columns have undergone differential settlement.

It is recommended a detailed engineering survey be conducted to establish all dimensions, elevations and the horizontal and vertical alignment of the arches and supporting columns of both the North and South porticos. (Possibly, Metric Building Surveying technique using R.E.D.M. survey instruments and single image photo-graphs for correlation with a finite element structural analysis). With this information, it would be possible to establish the extent of displacements since initial construction. It would also be possible to establish whether or not the foundations for the columns have undergone differential settlement.

Subsequent to the completion of the engineering survey, it is recommended a detailed structural engineering analysis be conducted on the arches across the front of the porticos. The structural analyses will determine the cause of the observed displacements and be essential in determining the restoration design details.

To address the issue of column settlement, it will be necessary to establish the construction details of the existing foundations supporting the stone masonry columns of the porticos. It will be necessary to dismantle the stone masonry landings and stairs (steps) and excavate to the base of the foundations supporting each individual stone masonry column. At that time, the below grade stonework should be assessed as well as the engineering characteristics of the stonework upon which it assumed the column footings are bearing. After stabilizing the footings (if necessary) for each individual stone masonry column of the portico, the stone masonry landings and stairs could be restored.

After a structural assessment of the existing foundations have been made, the decision could be made as to whether or not the stone masonry arches of the North and South porticos should be dismantled and rebuilt. The extent of dismantling and rebuilding would include removal of stonework to the low roof/second floor level of the portico. The restored stonework could include new stones to replace the existing damaged stones.

In the meantime, the stonework of the masonry arches of the North and South porticos should be carefully monitored to determine the magnitude of any continued displacements. If, further displacements are noticed, additional steel members could be installed as a safety precaution to prevent collapse.

*******End of “Draft” Interim Report*******

Appendix “A”

- **Figures; 1 to 10**

- **Drawing A-11-Third Floor Plan From Tender Documents “Temporary Stabilization and Selected Masonry Restoration” of 2013**

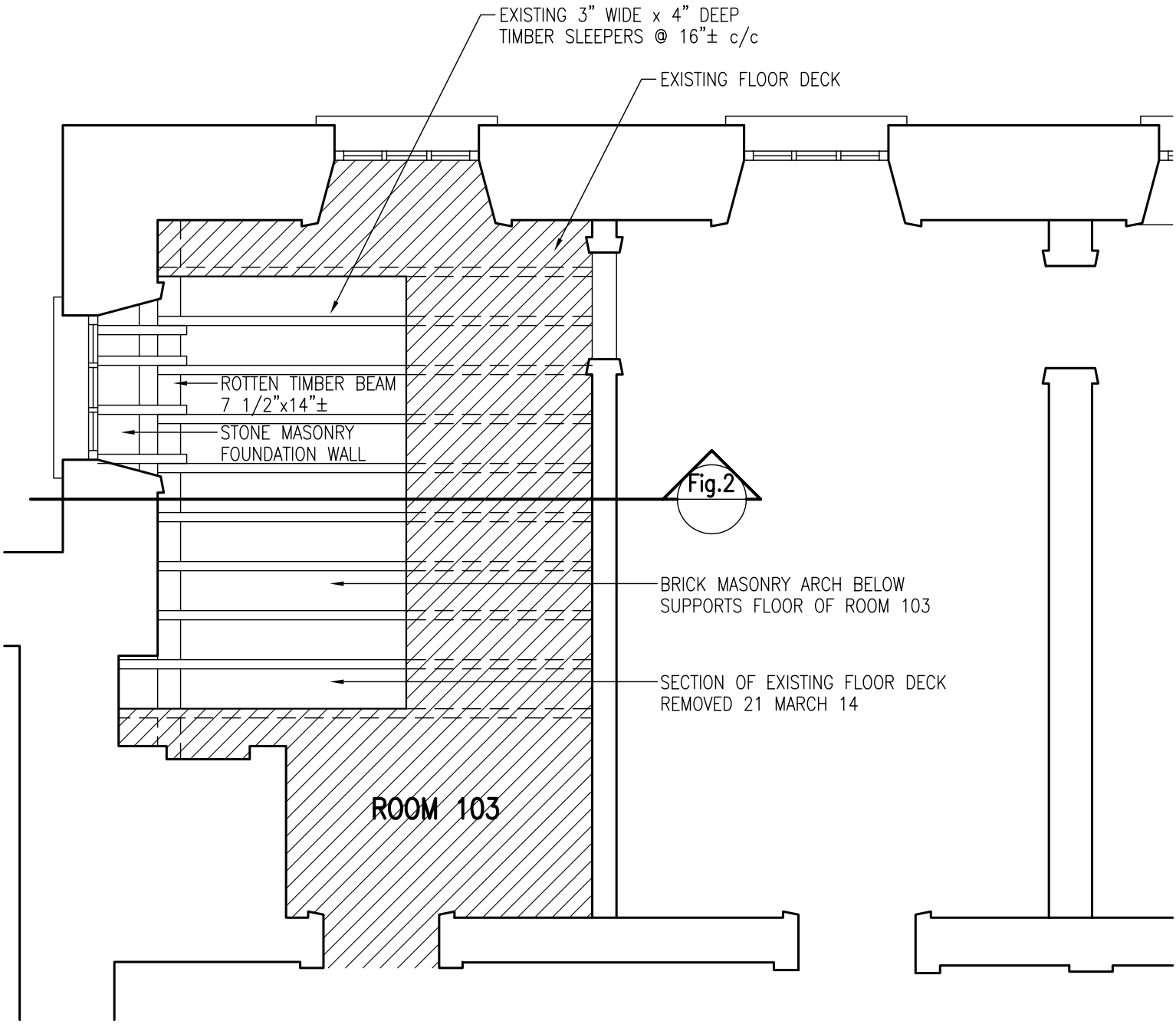


Figure 1
PLAN – EXISTING
SPEAKER'S OFFICE FLOOR (ROOM 103)

SPEAKER'S OFFICE (ROOM 103)

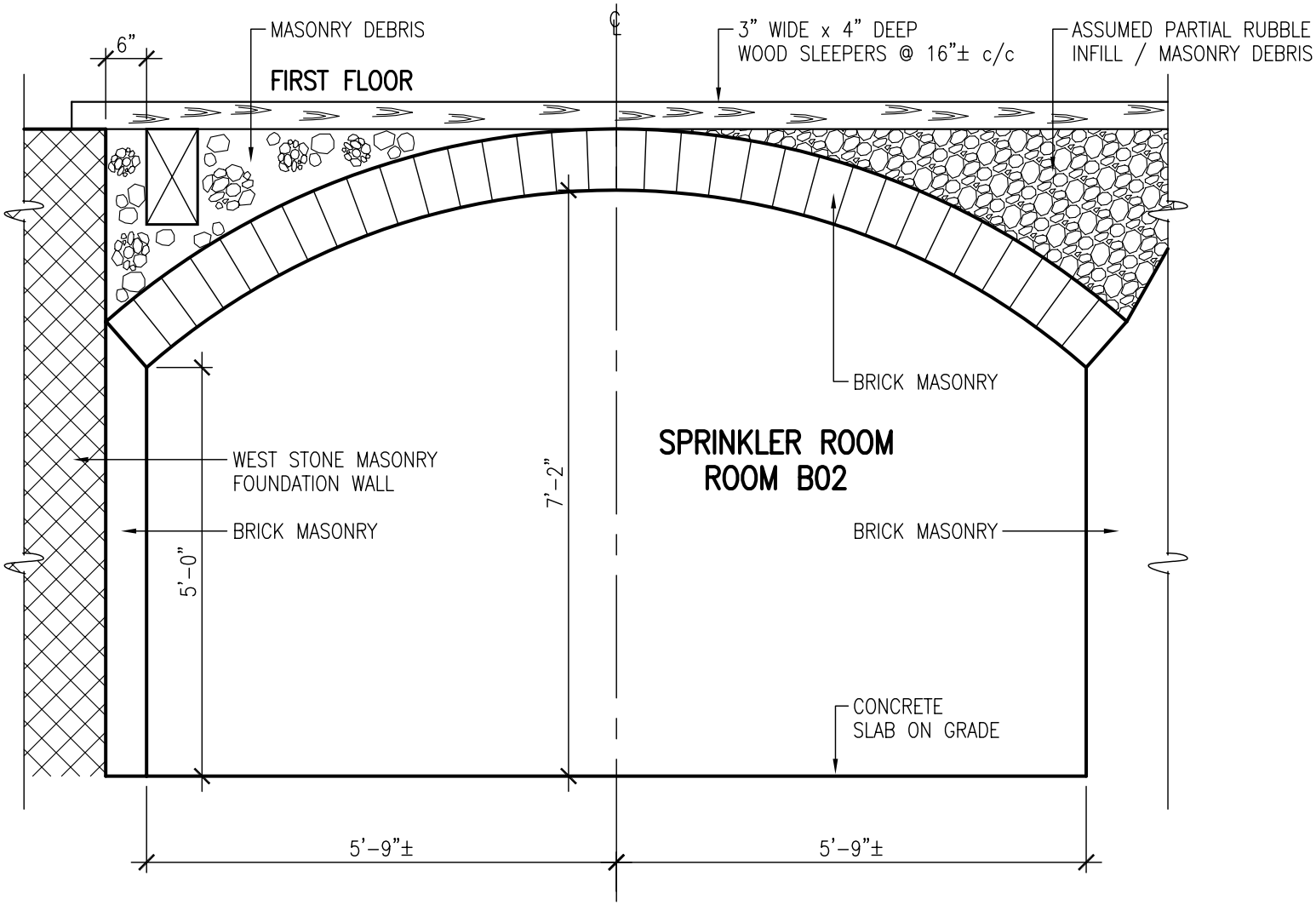


Figure 2
EXISTING SECTION THROUGH SPEAKER'S OFFICE FLOOR
INCLUDING SUPPORTING ARCH ROOF OF BRICK MASONRY VAULT BELOW
(SPRINKLER ROOM)

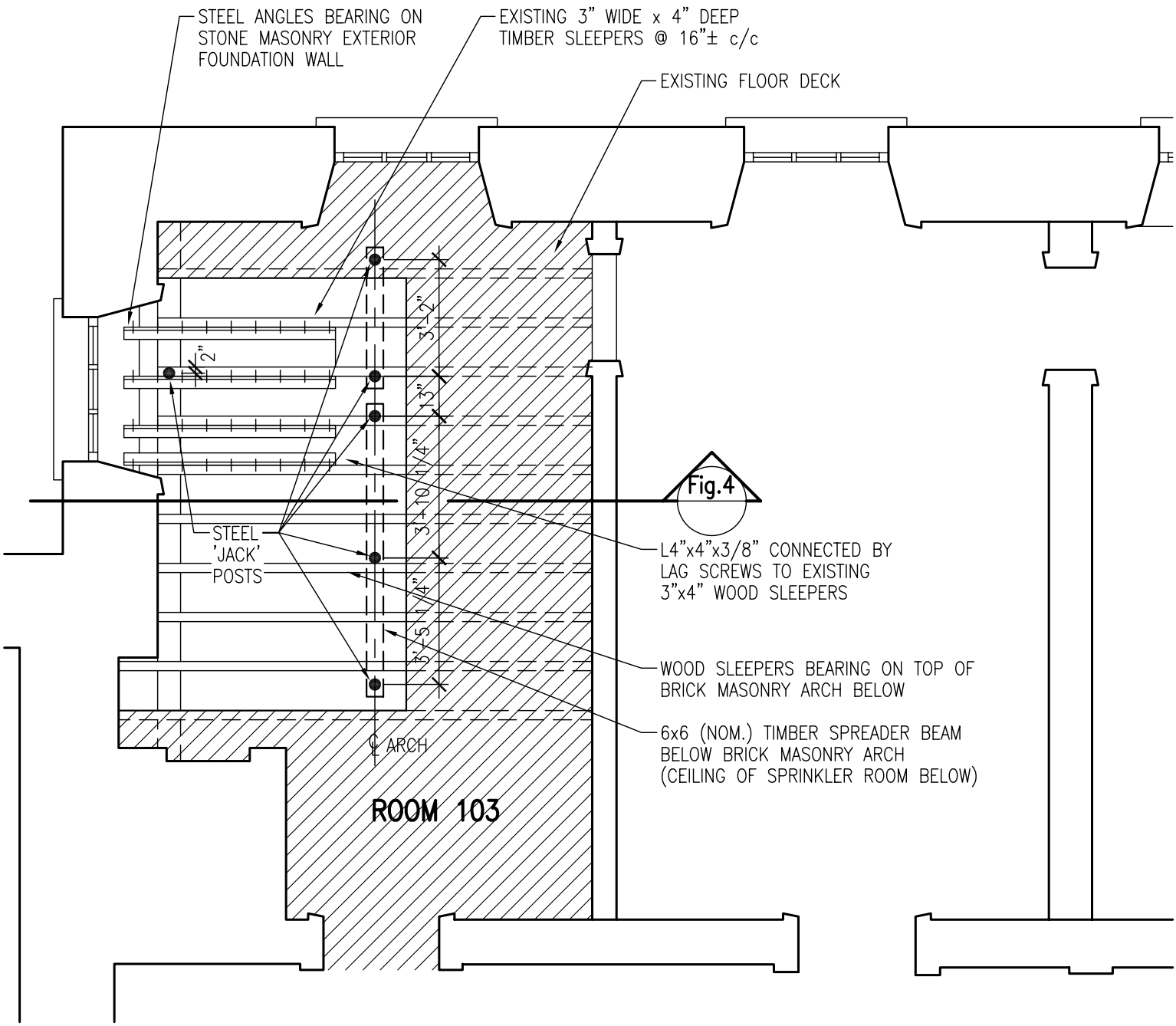


Figure 3
PLAN – TEMPORARY STRUCTURAL SUPPORT OF SPEAKER'S OFFICE FLOOR

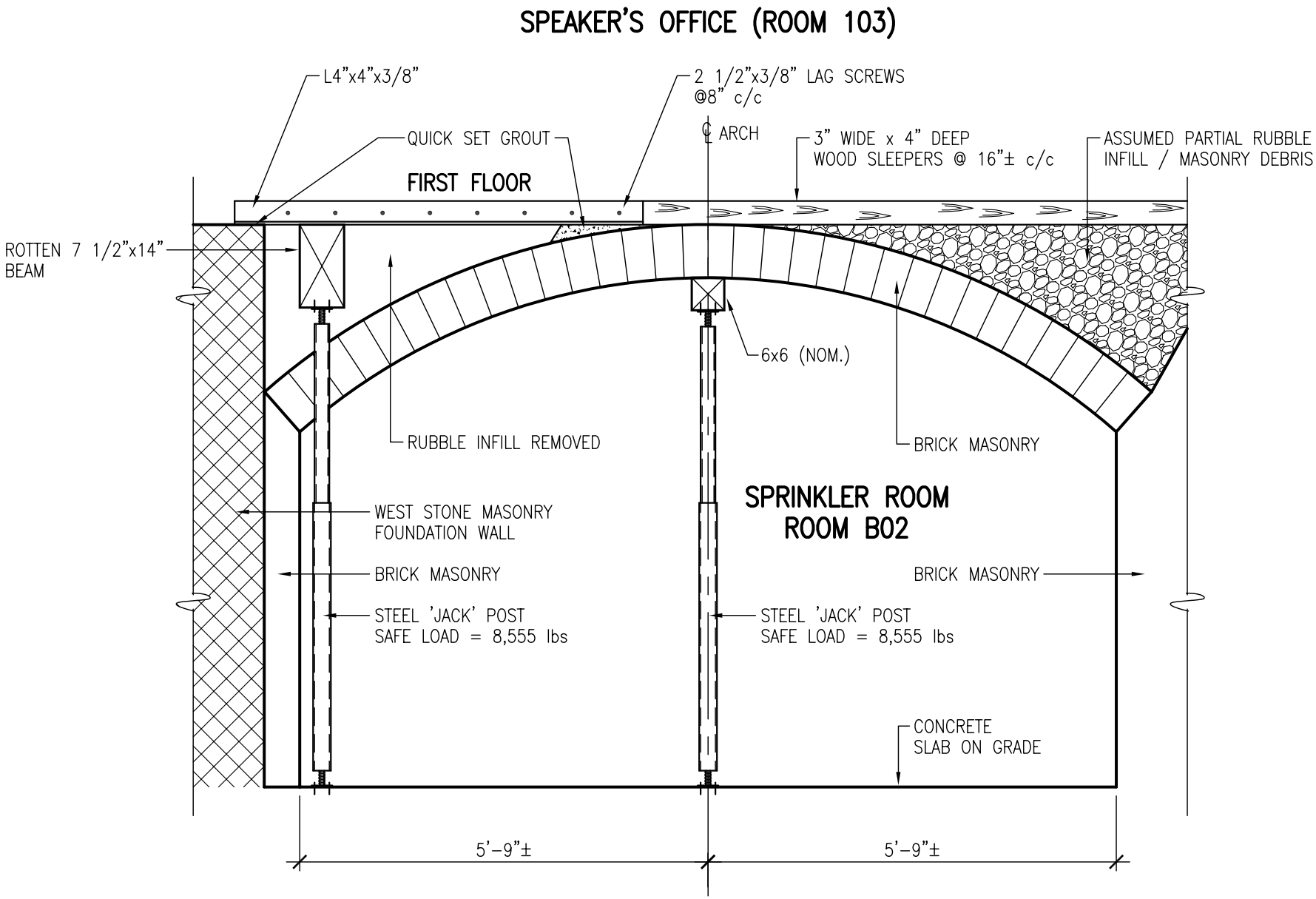


Figure 4
SECTION SHOWING STRENGTHENING OF TIMBER SLEEPERS AND SHORING OF ROTTEN TIMBER BEAM OF SPEAKER'S OFFICE FLOOR AND SHORING OF ARCH ROOF OF BRICK MASONRY VAULT BELOW (SPRINKLER ROOM)

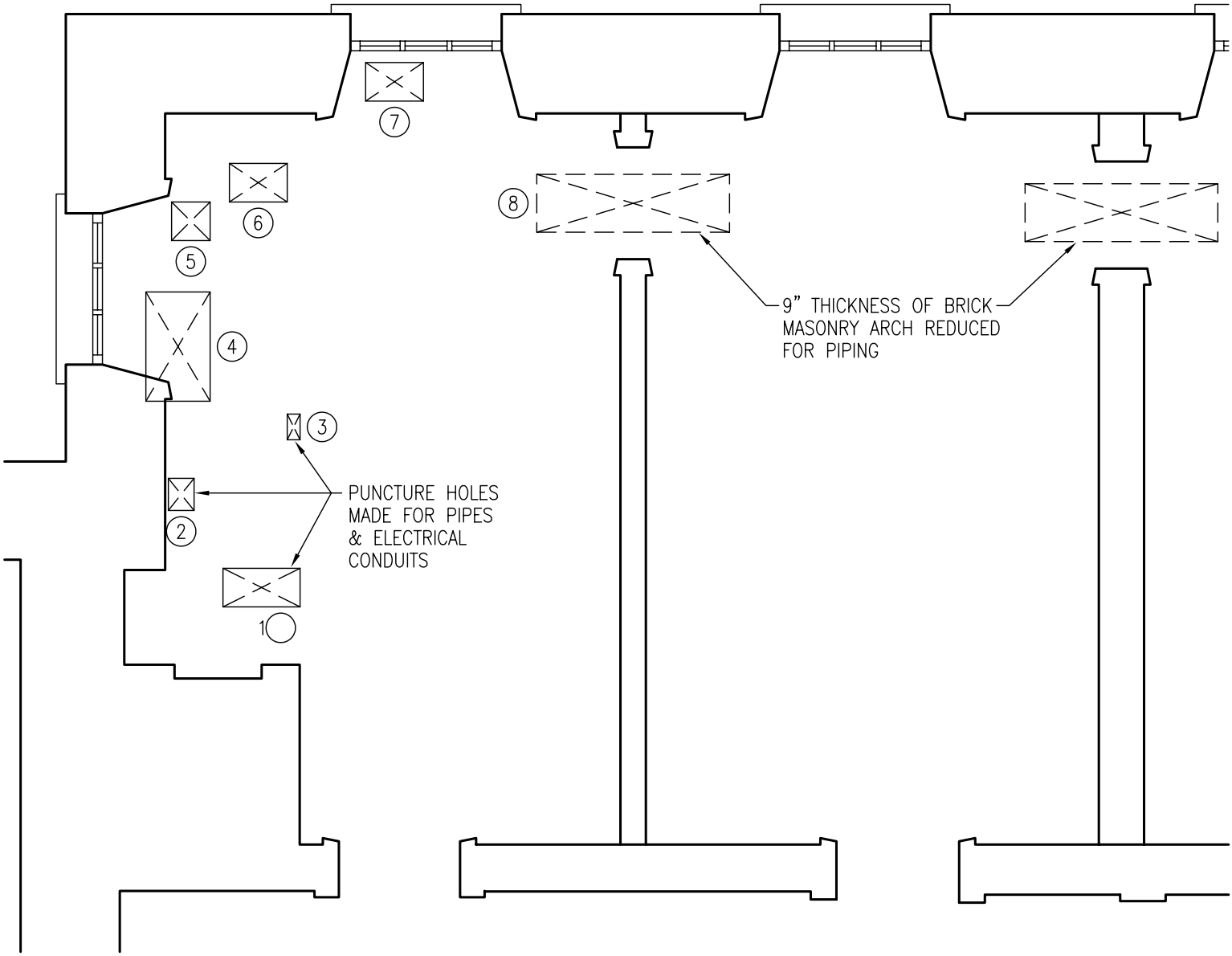
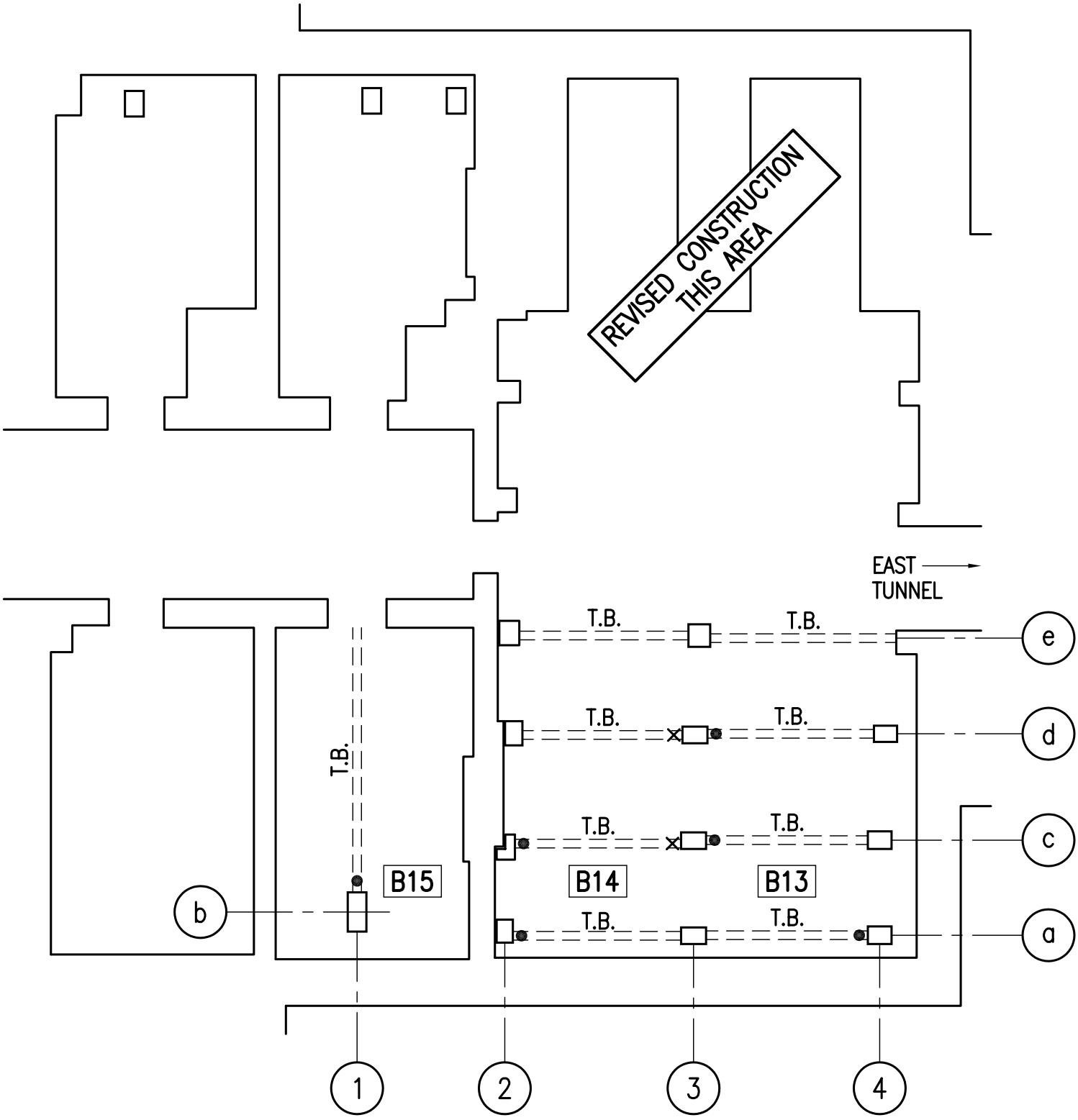


Figure 5
PLAN – LOCATION OF PUNCTURE HOLES IN BRICK MASONRY ARCH SUPPORTING THE SPEAKER'S OFFICE FLOOR



LEGEND

T.B. EXISTING TIMBER BEAM

× EXISTING STEEL 'JACK' POST

● NEW STEEL 'JACK' POST

Figure 6
SOUTHEAST BASEMENT AREA
ROOMS B13, B14 & B15

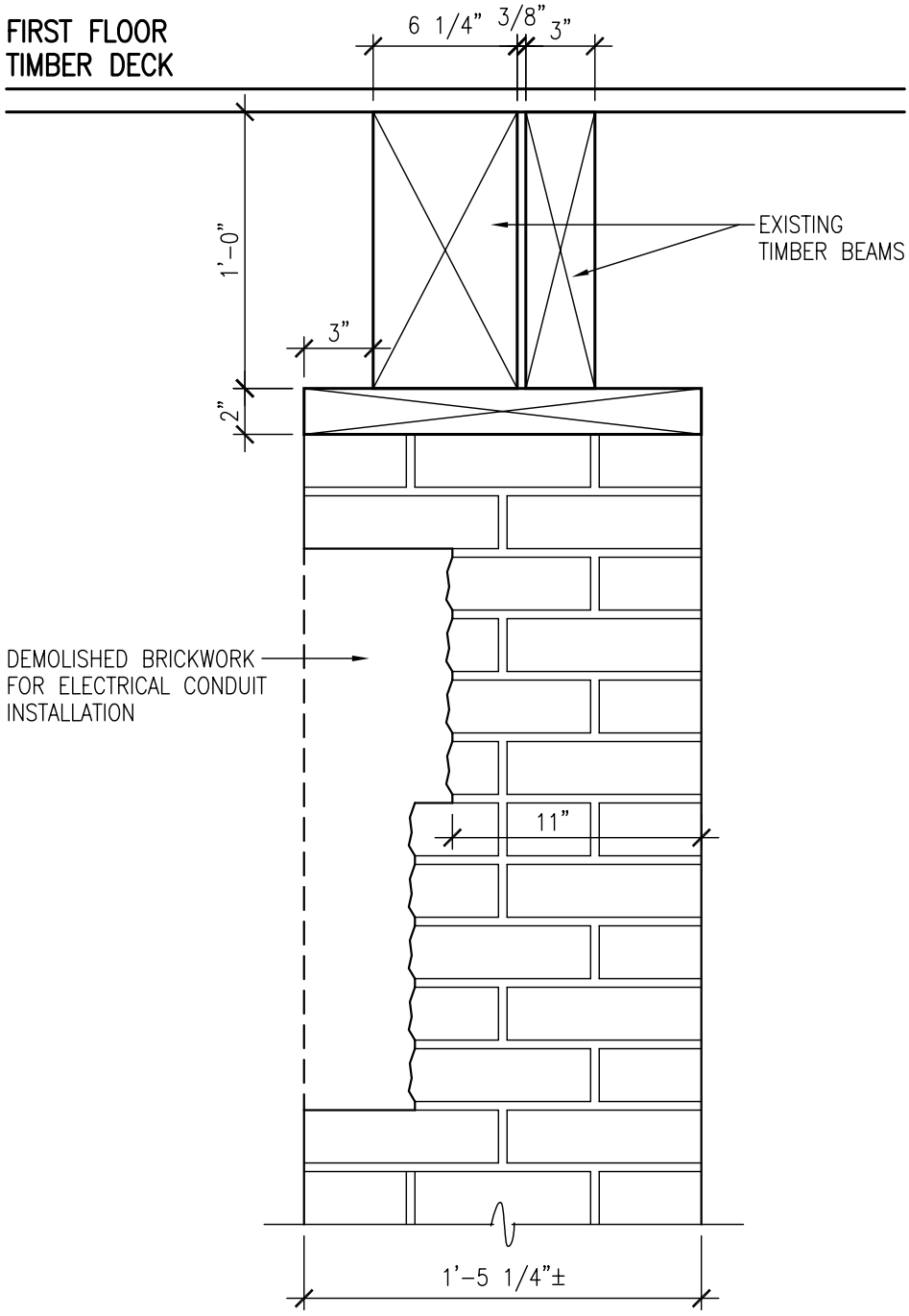


Figure 7
EAST ELEVATION
DAMAGED BRICK MASONRY COLUMN 2a,
SOUTHWEST CORNER OF BASEMENT ROOM B14

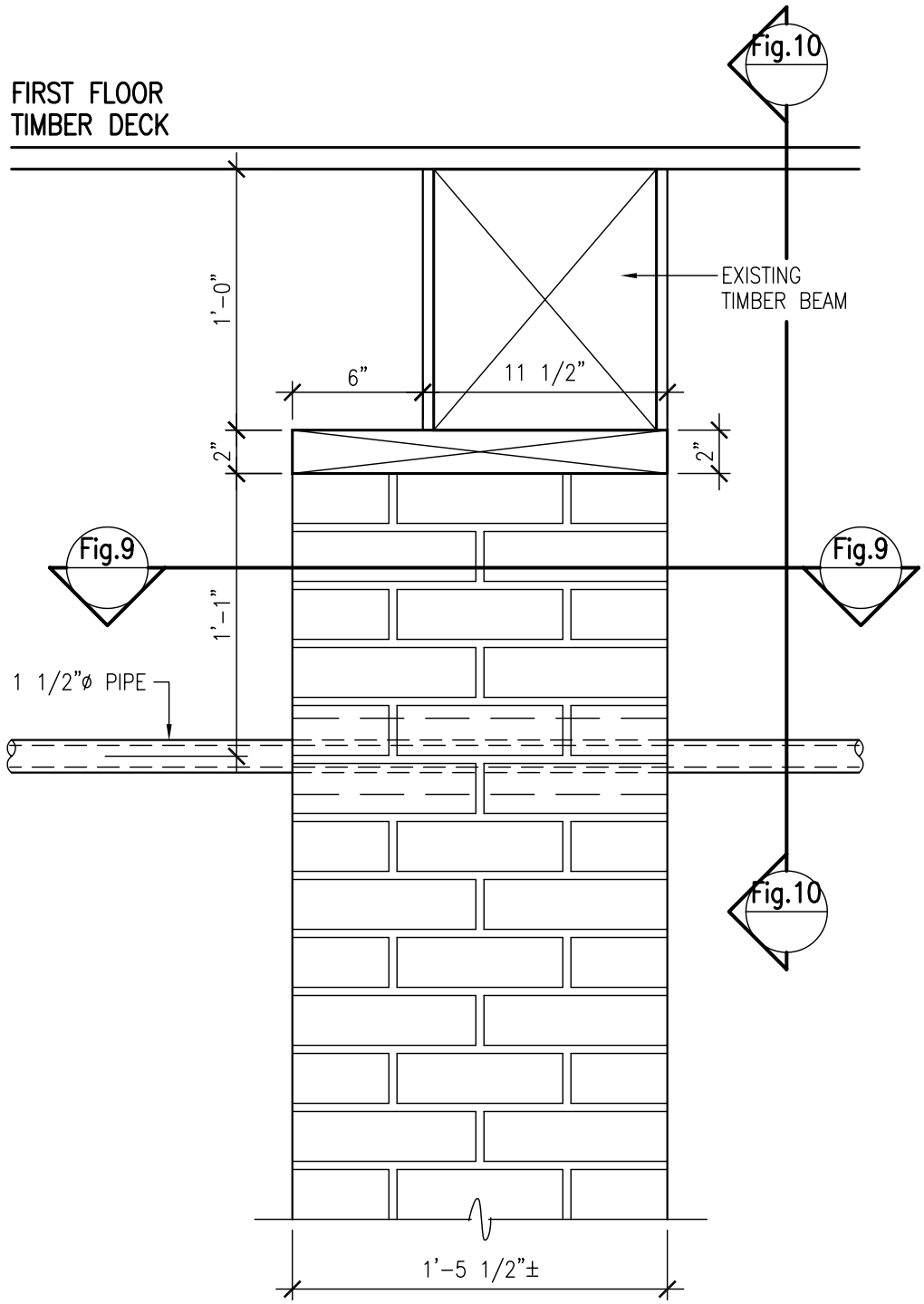


Figure 8
EAST ELEVATION
BRICK MASONRY COLUMN 2c,
BASEMENT ROOM B14

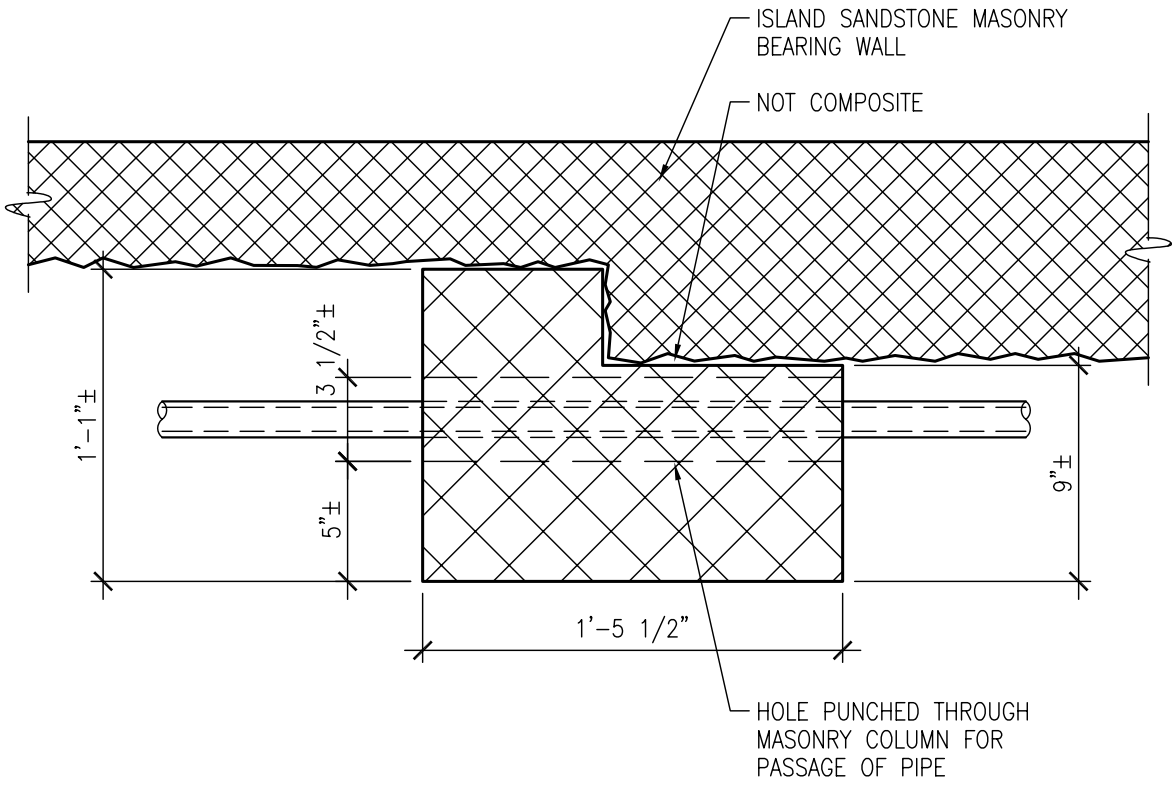


Figure 9
PLAN SECTION
BRICK MASONRY COLUMN 2c,
BASEMENT ROOM B14

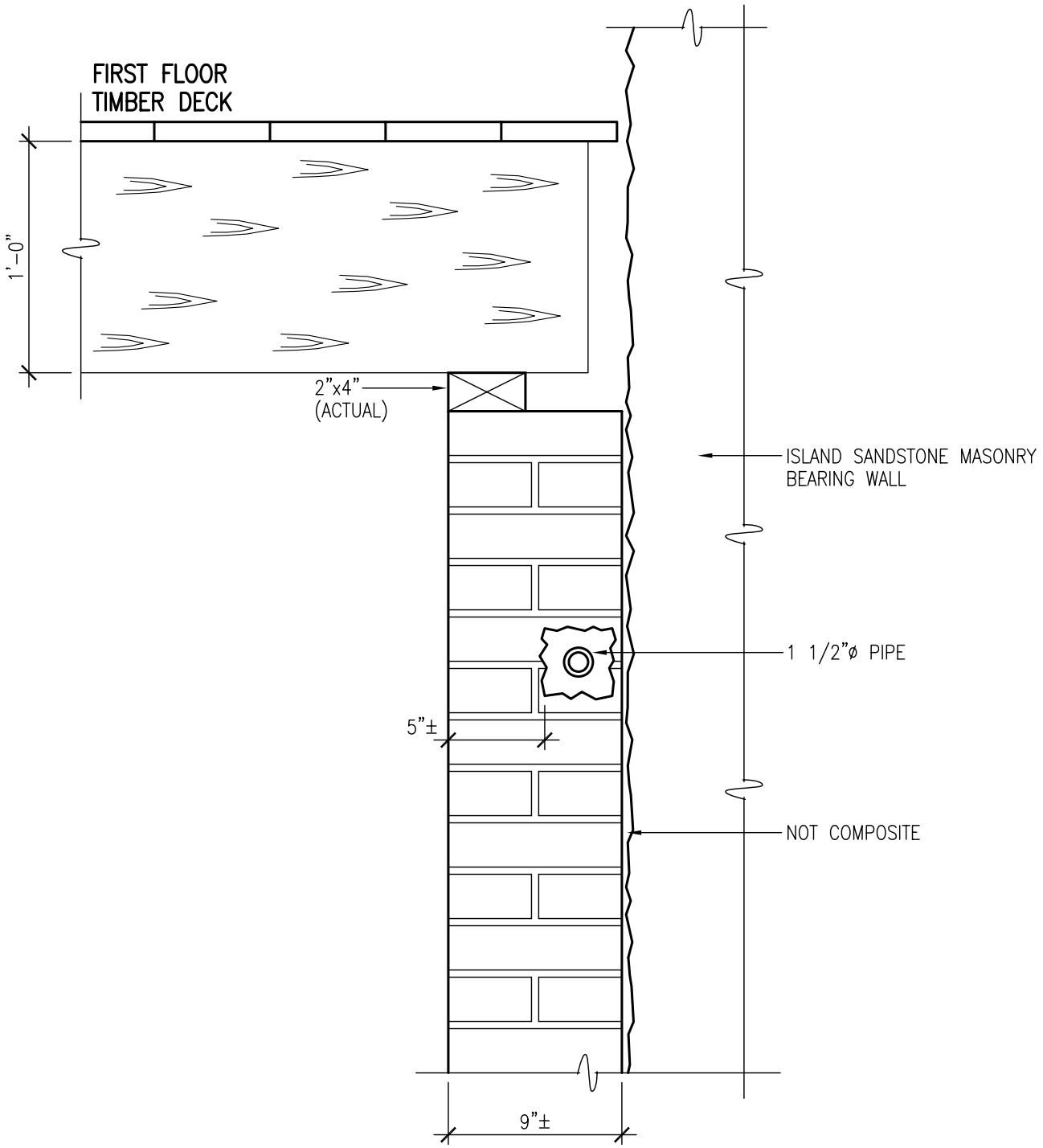
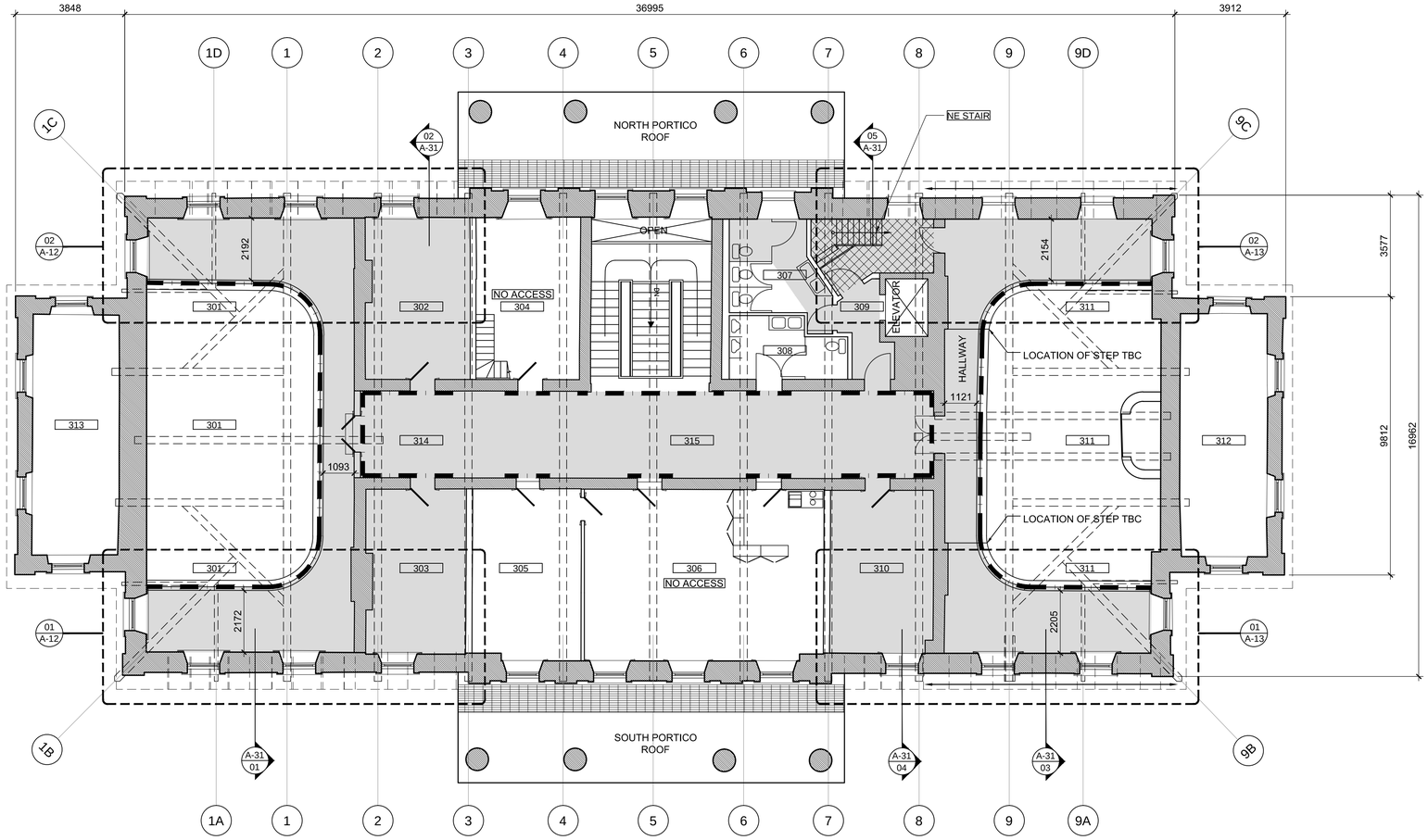


Figure 10
SECTION VIEWING SOUTH,
BRICK MASONRY COLUMN 2c,
BASEMENT ROOM B14



GENERAL NOTES:

1. NO PUBLIC OR STAFF ACCESS PERMITTED DURING CONSTRUCTION.
2. TEMPORARY BARRIERS TO BE MAINTAINED DURING CONSTRUCTION
3. BARRIERS INDICATED ON THIS PLAN ARE MINIMUM REQUIRED. ADDITIONAL ISOLATION OF AREAS DURING CONSTRUCTION FOR CONTROL OF DUST & DEBRIS SHALL BE PROVIDED BY THE CONTRACTOR AS IS REQUIRED BY THEIR WORK WORK SEQUENCE.
4. IN ROOMS 301, 302, NE STAIR, 311 & 310 TEMPORARILY PROTECT INTERIOR FACE OF WINDOWS.

REPAINTING SCOPE OF WORK:

1. NE STAIR (GND,1ST,2ND,3RD FLOORS)
   - REPAINT ALL WALLS.
   - REPAINT STEEL STAIR HANDRAILS, GUARDS, STRINGERS & U/S OF STEEL TREADS.
2. RM 301 - NORTH & SOUTH WALLS INCL. CORNICE
   - GALLERY CEILINGS WITHIN CONST. AREA
   - WINDOW TRIM (SEE A-40)
3. RM 302 - PAINT ALL WALLS
   - WINDOW TRIM (SEE A-40)
   - PLASTER CEILING (PRIME ONLY)
4. RM 307 - NORTH & EAST WALLS
   - PLASTER CEILING (PRIME ONLY)
5. RM 303 - PAINT ALL WALLS
   - WINDOW TRIM (SEE A-40)
6. RM 310 - PAINT ALL WALLS
   - WINDOW TRIM (SEE A-40)
7. RM 311 - NORTH & SOUTH WALLS INCL. CORNICE
   - GALLERY CEILINGS WITHIN CONST. AREA
   - WINDOW TRIM (SEE A-40)

3RD FLOOR PLAN LEGEND

- EXTENT OF SCAFFOLDING ON PORTICO ROOFS PROTECT EXISTING ROOFING WITH TEMPORARY PLATFORM TO DISTRIBUTE LOADS
- EXTENT OF FULL HEIGHT TEMPORARY BARRIER FOR CONTROL OF DUST & DEBRIS APPROX. 3450mm HIGH
- INDICATES CONSTRUCTION ACCESS STAIR
- INDICATES EXTENT OF EXISTING FINISHES INCLUDING CEILINGS, WALL, FLOORS, DOORS, WINDOWS & TRIM THAT ARE TO BE PROTECTED, CLEANED OR HAVE DAMAGED PORTIONS REPAIRED & REPLACED AT THE END OF CONSTRUCTION

01 A-11 3RD FLOOR PLAN
1:100

Parcs Canada Parks Canada

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SPENCER R. HIGGINS, ARCHITECT INCORPORATED
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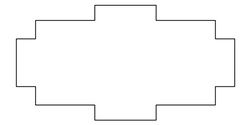
telephone (416) 922-7507 fax (416) 922-1681 www.higginsarchitect.com

KEY PLAN



THIS DOCUMENT MUST NOT BE USED FOR CONSTRUCTION PURPOSES

A	FOR CLIENT REVIEW & COSTING	13.04.05
révisions *revisions*		date

A no. du détail *detail no.*
B no.de la feuille–où détail exigé *sheet no. – where detail required*
C no. de la feuille–où détaillé *sheet no. – where detailed*

Projet *Project*

PROVINCE HOUSE

TEMPORARY STABILIZATION AND SELECTED MASONRY RESTORATION

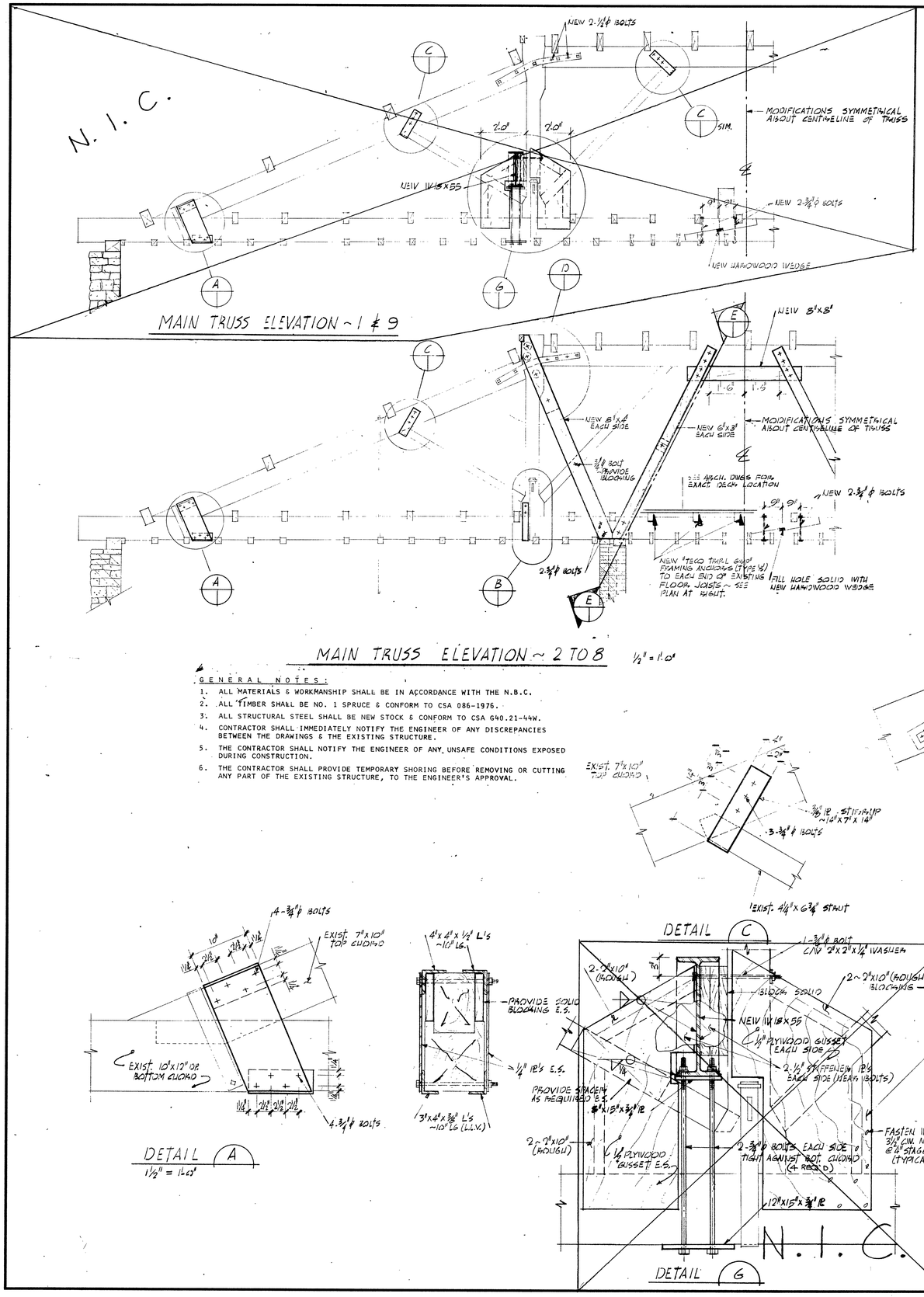
CHARLOTTETOWN P.E.I.

Dessin *Drawing*

3RD FLOOR PLAN
PLAN DE 3EME ETAGE

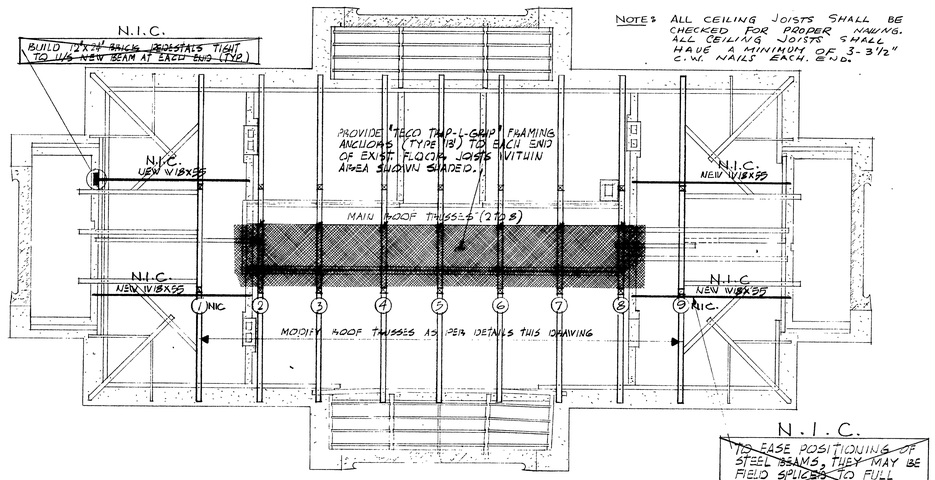
METERS 1 0 1 2 3 4 5

Conçu par *Designed by*: Taylor Hazell Architects LTD. — 2013--4--05 Date
Dessiné par *Drawn by*: Abe G. – Nuri L. — 2013--4--05 Date
Approuvé par *Approved by*: Mark Wronski — 2013--4--05 Date
Soumission *Tender*: Greg Shaw, Administrateur de projets APC — *PCA Project Manager*
No de projet *Project number*: 30021341 (APC / PCA)
Nom du fichier *File name*: A11 3RD FLOOR PLAN
No de classement *File no*:
No de plan ou dessin *File name*: No feuille *Sheet no*: A–11



GENERAL NOTES:

1. ALL MATERIALS & WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE N.B.C.
2. ALL TIMBER SHALL BE NO. 1 SPRUCE & CONFORM TO CSA 086-1976.
3. ALL STRUCTURAL STEEL SHALL BE NEW STOCK & CONFORM TO CSA G40.21-44W.
4. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN THE DRAWINGS & THE EXISTING STRUCTURE.
5. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY UNSAFE CONDITIONS EXPOSED DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL PROVIDE TEMPORARY SHORING BEFORE REMOVING OR CUTTING ANY PART OF THE EXISTING STRUCTURE, TO THE ENGINEER'S APPROVAL.

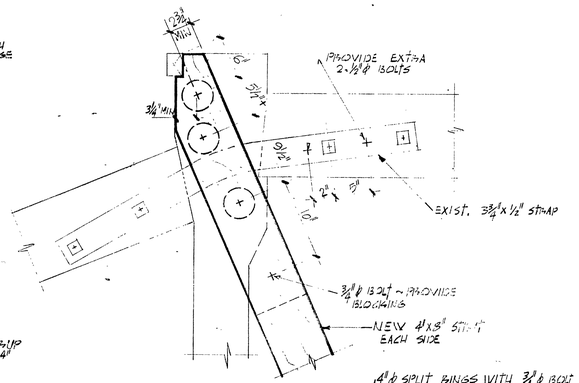


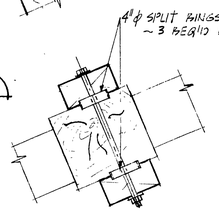
EXISTING ROOF FRAMING PLAN (PRINCIPAL MEMBERS SHOWN ONLY)
3/32" = 1'-0"

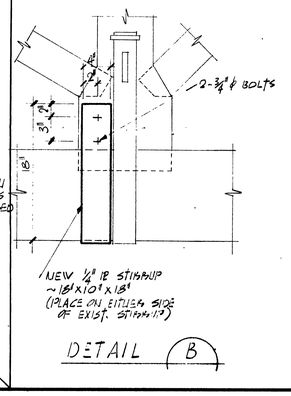
N.I.C.
TO EASE POSITIONING OF STEEL BEAMS, THEY MAY BE FIELD SPLICED TO FULL CAPACITY TO APPROVAL OF ENGINEER.

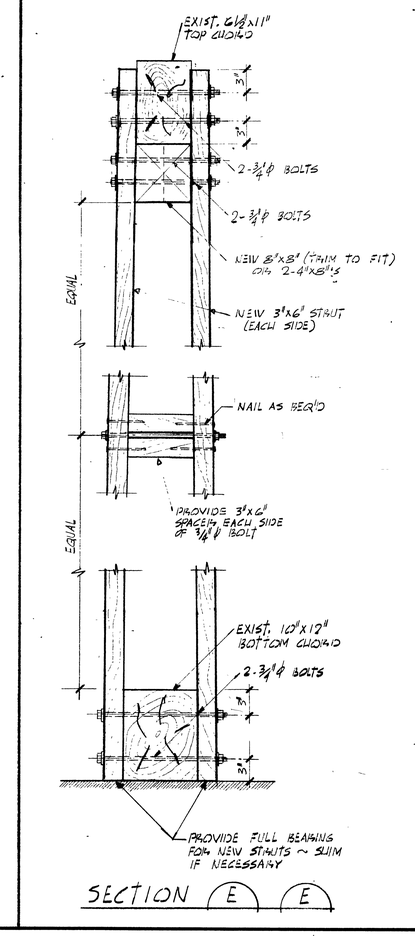
TRUSSES 1 & 9 N.I.C.

N.I.C. – NOT IN THIS CONTRACT









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revisions | date

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REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA

A detail no. / détail no
B location dwg. no. / sur dessin no
C drawing no. / dessin no

drawn by / tracé par: D. WING
scale / échelle: AS NOTED
designed by / établi par: V. PERRY
checked by / vérifié par:
job captain / chef du projet: John Wilcox — date: Jan 16/79
responsible officer / officier responsable: — date: 1/16/79

project title / titre du projet
PROVINCE HOUSE
Charlottetown, P.E.I.

drawing title / titre du dessin
MAIN TRUSS REINFORCING

reference no. / no de référence: HAPH 79/R3
dwg no. / dessin no: 2 - 1

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Appendix “B”

Photographs

Appendix B - Photographs

Tab 1: Speaker's Office Floor and Clay Brick Masonry Arch Roof of the Sprinkler Room Below

(Photographs; SR-1 to SR-40)

Tab 2: Deteriorated Clay Brick Masonry Columns in Southeast Basement Area Rooms; B13, B14 and B15

(Column 1b – Photographs; BSE-1 to BSE-9)
(Column 2a – Photographs; BSE-10 to BSE-11)
(Column 2c – Photographs; BSE-12 to BSE-15)
(Column 3c – Photographs; BSE-16 to BSE-22)
(Column 3d – Photographs; BSE-23 to BSE-26)
(Column 4a – Photographs; BSE-27 to BSE-33)

Tab 3: Roof Framing

(Photographs; RF-1 to RF-13)

Tab 4: Deflected Floor East Side of West Gallery of Legislative Assembly Room

(Photographs; GF-1 to GF-4)

Tab 5: Deflected Floor of East Gallery of Confederation Room

(Photograph GF-5)

Tab 6: Displaced Sandstone Units of Stone Masonry Arches of North and South Porticos

(Photographs; SM-1 to SM-6)

Tab 1: Speaker's Office Floor and Clay Brick Masonry Arch Roof of the Sprinkler Room Below

(Photographs; SR-1 to SR-40)

PHOTOGRAPH SR-1:

Speaker's Office (Room 103) viewing North. The carpet was rolled back and the 1980's timber floor deck removed exposing the original East/West spanning timber "sleepers". The East end of the "sleepers" are supported on the top of the arch shaped roof of the brick masonry vault housing the Sprinkler Room below. (Basement Room B02).

The West end of the "sleepers" are supported by a deteriorated 7 ½ in. x 14 in. timber beam spanning North/South. Debris (clay bricks, sections of stone and sand) were found randomly placed between the "sleepers" on top of various areas of the brick masonry vault.

PHOTOGRAPH SR-2:

The debris (clay bricks, sections of stone and sand) was removed from the top of the brick masonry vault revealing numerous puncture holes within the West side of the roof of the clay brick masonry vault. Viewing Northwest. The size and locations of the holes within the masonry arch can be found in Figure 5 "Plan – Location of Puncture Holes in Brick Masonry Arch Supporting the Speaker's Office Floor", Appendix "A", Volume I.

PHOTOGRAPH SR-3:

The screw end of a steel rod of a pipe hanger screwed through the ¾ in. thick floor boards for support of the main water supply pipe within the Sprinkler Room below. The upper ¾ in. layer of the floor boards was removed.

PHOTOGRAPH SR-4:

The ¾ in. floor board shown in Photograph SR-3 was split at the time of the installation of pipe hanger. As a safety precaution, the main water supply pipe to the Sprinkler Room was temporarily supported from the floor of the Sprinkler Room. (Refer to Photograph SR-32, Appendix "B", Volume II).

PHOTOGRAPH SR-5:

Shows the threaded end of the steel rod pipe hanger shown in Photographs; SR-3 and SR-4, Appendix “B”, Volume II.

PHOTOGRAPH SR-6:

The Southwest area of the floor of the Speaker's Office. Shows a hole approximately 1 ft. wide x 2 ft. long made within the brick masonry arch roof of the vault housing the Sprinkler Room below. (Refer to Figure 5 (Hole1), Appendix "A", Volume I).

PHOTOGRAPH SR-7:

Close-up view of Photograph SR-6, (Hole 1), Appendix “B”, Volume II.

PHOTOGRAPH SR-8:

Close-up view of Photograph SR-6 (Hole 1), from below within the Sprinkler Room. (Refer to Appendix "B", Volume II).

PHOTOGRAPH SR-9:

East/West spanning timber "sleepers" located at approximately 16 in. centre to centre with their West end bearing on top of the 7 ½ in. wide x 14 in. deep North/South spanning timber beam. Also shows Holes; 1 to 4 within the brick masonry arch. (Refer to Figure 5, Appendix A, Volume I).

PHOTOGRAPH SR-10:

Close-up view of a 8 in. x 10 in. hole within the brick masonry arch roof of the vault below. (Refer to Figure 5 (Hole 2), Appendix "A", Volume I. The hole is approximately 8 in. x 10 in.).

PHOTOGRAPH SR-11:

Viewing North along the North/South spanning timber beam. Shows Holes; 3 and 4 within the brick masonry arch roof of the vault below. Hole 3 is approximately 4 in. x 8 in. while Hole 4 is approximately 1 ft. 8 in. x 2 ft. 10 in. (Refer to Figure 5 (Holes; 3 and 4), Appendix "A", Volume I).

PHOTOGRAPH SR-12:

Close-up view of Hole 3 and the South edge of Hole 4. (Refer to Figure 5, Appendix "A", Volume I).

PHOTOGRAPH SR-13:

View of the West side of the arch roof of the vault housing the Sprinkler Room. Shows Holes; 2, 3 and 4.

PHOTOGRAPH SR-14:

Underside of the 7 ½ in. x 14 in. timber beam viewing through Hole 4 located on the West side of the brick masonry arch roof of the vault housing the Sprinkler Room. Viewing Northwest.

PHOTOGRAPH SR-15:

View of the deteriorated condition of the 7 ½ in. wide x 14 in. timber beam. The wood rot extends approximately 50% of the depth of the beam.

PHOTOGRAPH SR-16:

View of Holes; 3 and 4 within the brick masonry arch roof of the vault below. Shows the 3 in. wide x 4 in. deep timber "sleepers" bearing on top of the 7 ½ in. x 14 in. timber beam. Also shows the splice extensions to the wood "sleepers" bearing on top of the stone masonry wall below the window opening of the West wall. The "sleeper" extensions were loose.

PHOTOGRAPH SR-17:

Shows the extensions to the 3 in. wide x 4 in. deep timber “sleepers” for support of the floor deck within the recessed wall opening at the window. Also shows the existing piping.

PHOTOGRAPH SR-18:

Northwest corner of the Speaker's Office floor. Shows Holes; 5 and 6 within the brick masonry arch of the vault. Shows a heating pipe passing diagonally through and across a "sleeper" adjacent to the North side of the wall opening at the window.

PHOTOGRAPH SR-19:

Viewing Southwest across the Western half of the Speaker's Office floor.

PHOTOGRAPH SR-20:

3 in. wide x 4 in. deep timber "sleepers" bearing on top of the 7 ½ in. x 14 in. timber beam located at the Southwest end of the Speaker's Office. Viewing Southwest.

PHOTOGRAPH SR-21:

View of the existing structural support system, Northwest area of the Speaker's Office floor. A significant portion of the brick masonry arch is missing and the 7 ½ in. x 14 in. timber beam is rotten.

PHOTOGRAPH SR-22:

Shows a heating pipe passing diagonally through the end of the East/West spanning "sleeper". There is no bearing area for the "sleeper" on the stonework of the West foundation wall.

PHOTOGRAPH SR-23:

Shows the 21 March 2014 installation of a steel "jack post" through Hole 4 within the brick masonry arch ceiling of the vault for support of the deteriorated 7 ¼ in. x 14 in. timber beam above.

PHOTOGRAPH SR-24:

Close-up view of the top plate of the 21 March 2014 installed steel “jack post” bearing on the underside of the deteriorated North/South spanning timber beam of the Speaker’s Office floor construction.

PHOTOGRAPH SR-25:

Strengthening of four 3 in. wide x 4 in. deep timber “sleepers” by the installation of 4 in. x 4 in. x 3/8 in. steel angles. The steel angles were connected to the sides of the “sleepers” by lag screws installed at 8 in. centre to centre. The East end of the steel angles bear on top of the brick masonry arch roof of the vault below. The West end of the steel angles bear on the top of the stone masonry exterior foundation wall. Viewing West.

PHOTOGRAPH SR-26:

East bearing end of the steel angles. The horizontal 4 in. wide leg of the steel angles are bearing on a bed of “Quikcrete”, a quick setting cementious grout.

PHOTOGRAPH SR-27:

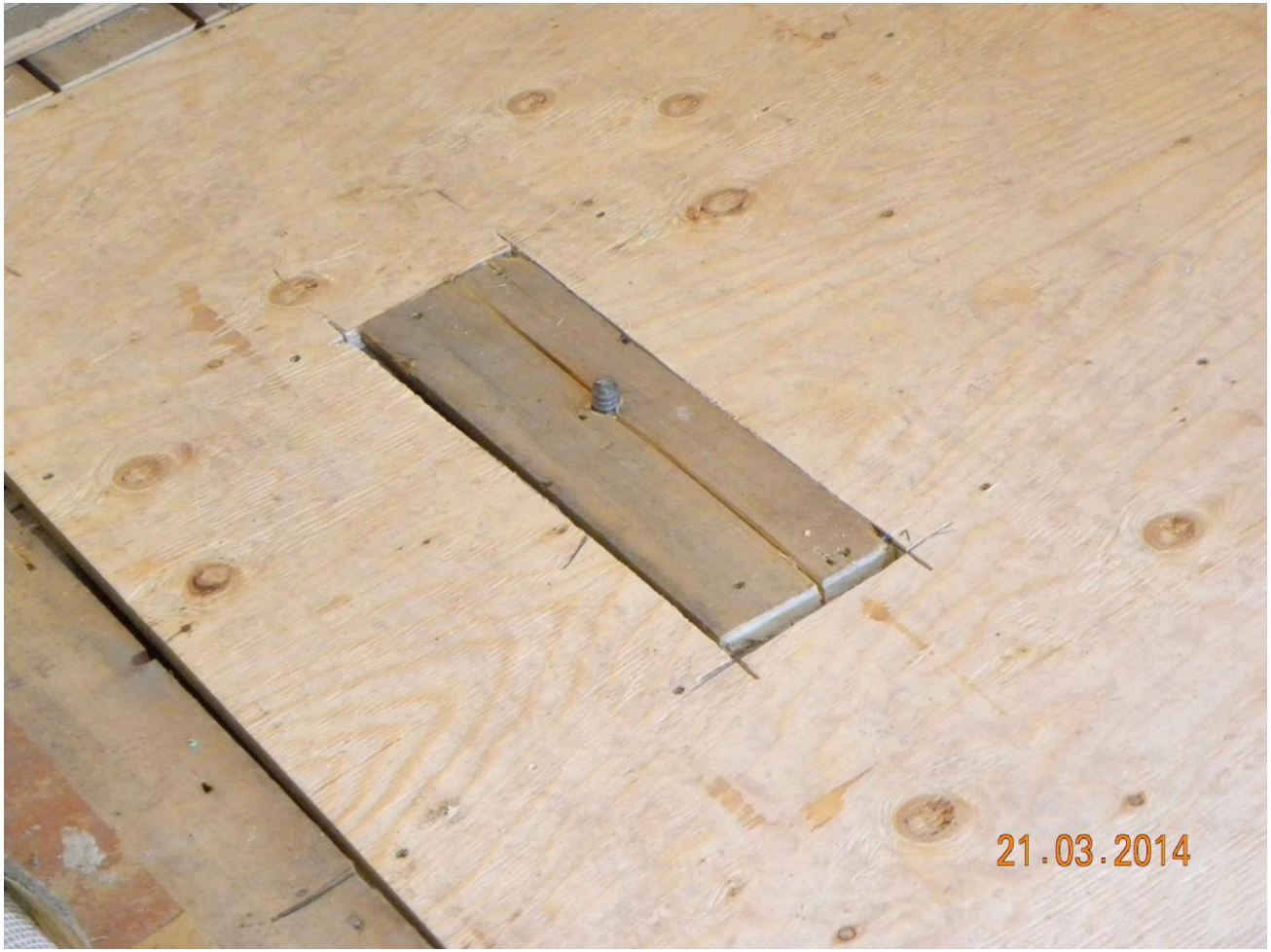
The West end of the steel angles are bearing on top of the West exterior stone masonry foundation wall of the building. The horizontal leg of the steel angles are bearing on a bed of "Quikcrete", a quick setting cementious grout.

PHOTOGRAPH SR-28:

Shows the West bearing end of the 4 in. x 4 in. steel angle having its vertical leg coped to permit passage of the pipe.

PHOTOGRAPH SR-29:

Viewing Northwest within the Speaker's Office. Shows the first layer of ¾ in. thick plywood anchored to the timber "sleepers" with 1 ¾ in. long #8 wood screws.



PHOTOGRAPH SR-30:

Shows the end of the threaded rod pipe hanger previously used for the support of the water supply pipe to the Sprinkler Room below. The water supply pipe is presently temporarily supported from the floor of the Sprinkler Room. (Refer to Photograph SR-32, Appendix "B", Volume II).

PHOTOGRAPH SR-31:

Installation of adjustable steel shores ("jack posts") with 6 in. x 6 in. (nominal) timber spreader beams spanning North/South for the temporary support of the brick masonry vault roof. The location of the "jack posts" can be found on Figure 5, Appendix "A", Volume I.

PHOTOGRAPH SR-32:

Temporary support for the water supply pipe previously supported by the rod hanger with its screw end anchored into the two layers of ¾ in. thick board flooring. Viewing Northwest.

PHOTOGRAPH SR-33:

Viewing towards the North end of the vault housing the Sprinkler Room. The two white lights in the centre of the photograph are from holes in the temporary plywood covering of the basement window opening.

PHOTOGRAPH SR-34:

Northern 6 in. x 6 in. (nominal) timber spreader supported by two steel "jack posts". (Refer to Figure 3, Appendix "A", Volume I).

PHOTOGRAPH SR-35:

Northern end of the Sprinkler Room containing the sprinkler system and three steel "jack posts" bearing on the concrete slab on grade of the Sprinkler Room floor.

PHOTOGRAPH SR-36:

View of the window opening at the North end of the Sprinkler Room. The plywood is not tight fitting around the window opening and two holes exist permitting rainwater entry.

PHOTOGRAPH SR-37:

Hole opening 7 within the brick masonry arch. Evidence of water staining and wood rot within the floor boards below the hot water radiator located in front of window, North wall of the Speaker's Office.

PHOTOGRAPH SR-38:

Horizontal pipe chase causing a reduction in the roof thickness of the Sprinkler Room vault as well as the roof of the adjacent vault (Room 104). (For reference purposes, horizontal pipe chase is noted as Hole 8, Figure 5, Appendix "A", Volume I).

PHOTOGRAPH SR-39:

Viewing East through the horizontal pipe chase extending through the lower Northern end of the brick masonry arch over the Sprinkler Room and the brick masonry arch over Room 104.

PHOTOGRAPH SR-40:

Viewing Northwest of the Speaker's Office. The carpet has been rolled back in place but not stretched into its final position. The carpet also remains to be cleaned. Photograph taken at approximately 1:30pm, 21 March 2014 enabling the Speaker's Office to be ready for occupancy on the morning of 24 March 2014.

Tab 2: Deteriorated Clay Brick Masonry Columns in Southeast Basement Area Rooms; B13, B14 and B15

(Column 1b – Photographs; BSE-1 to BSE-9)
(Column 2a – Photographs; BSE-10 to BSE-11)
(Column 2c – Photographs; BSE-12 to BSE-15)
(Column 3c – Photographs; BSE-16 to BSE-22)
(Column 3d – Photographs; BSE-23 to BSE-26)
(Column 4a – Photographs; BSE-27 to BSE-33)

Column 1b – Photographs; BSE-1 to BSE-9

PHOTOGRAPH BSE-1:

Clay brick masonry column located in Basement Room B15. The column is out of plumb and the brickwork within the bottom 2 ft. 10 in. has deteriorated. A North/South spanning timber beam is bearing on the top of the column. The timber beam is concealed with gypsum board. It appears, a 2 in. x 10 in. (nominal) timber joist is fastened to the East and West sides of the beam. Removal of a section of gypsum board from the underside of the beam revealed the beam had undergone extensive wood rot adjacent to the column. Viewing South within Room B15.

PHOTOGRAPH BSE-2:

East and North faces of brick masonry Column 1b. The plan dimensions of the undamaged top portion of the column measure 1 ft. 1 ¼ in. x 2 ft. 2 ½ in. representing a plan area of 351.12 in.^{2}. Without removing any of the deterior-ated masonry within the bottom portion of the column the minimum dimensions of the column measure 8 ½ in. x 1 ft. 10 in. representing a cross sectional area of 187 in.^{2}. Deterioration of the bottom portion of the column has resulted in a cross sectional loss area of approximately 47%. The bottom bricks are very weak and with little effort, rubbing the face of the bricks would cause considerable loss of material. Viewing Southwest.

PHOTOGRAPH BSE-3:

The deteriorated bottom portion of the East and the North faces of masonry Column 1b, Room B15. Viewing Southwest.

PHOTOGRAPH BSE-4:

Deteriorated bottom portion of East elevation Column 1b, Room B15. Viewing West.

PHOTOGRAPH BSE-5:

Deteriorated bottom portion of West elevation of Column 1b, Room B15. Viewing East.

PHOTOGRAPH BSE-6:

The top East portion of Column 1b with 6 ½ in. x 12 ½ in. deep section of brickwork removed for the passage of East/West spanning pipes and electrical conduit.

PHOTOGRAPH BSE-7:

View of the underside of the 7 ¼ in. wide x 1 ft. 2 in. deep timber beam with 2 in. x 10 in. (nominal) timber joists connected to the East and West sides of the timber beam. Considerable wood rot was detected on the underside of the 7 ¼ in. x 1 ft. 2 in. timber beam.

PHOTOGRAPH BSE-8:

Close-up of a rotten section on the underside of the timber beam in Room B15.

PHOTOGRAPH BSE-9:

Steel shore “jack post” installed for the support of the 7 ¼ in. x 1 ft. 2 in. timber beam. Viewing South.

Column 2a – Photographs; BSE-10 to BSE-11

PHOTOGRAPH BSE-10:

Brick masonry Column 2a located at the Southwest corner of the Basement Room B14. (Refer to Figure 6 “Southeast Basement Area, Rooms B13, B14 and B15”, Appendix “A”, Volume I). A large section of the South top side of the brick masonry column has been removed from the column during the installation of the electrical conduit. (Refer to Figure 7 “East Elevation of Damaged Brick Masonry Column 2a, Southwest Corner of Basement Room B14”, Appendix “A”, Volume I). The plan dimensions of the column are 1 ft. 5 ¼ in. (North/ South) x 1 ft. ½ in. (East/West). Approximately 40% of the plan bearing area of the upper portion of the column has been demolished.

PHOTOGRAPH BSE-11:

Close-up view of brick masonry Column 2a shown in Photograph BSE-10, Appendix “B”, Volume II.

Column 2c – Photographs; BSE-12 to BSE-15

PHOTOGRAPH BSE-12:

Left of centre of the photograph is Column 2c located at the Southwest corner of Basement Room B14. (Refer to Figure 6 “Southeast Basement Area Rooms; B13, B14 and B15”, Appendix “A”, Volume I).

PHOTOGRAPH BSE-13:

East face of brick masonry Column 2c. The East/West spanning timber beam (finished with a fire protective coating) is bearing on a 2 in. x 4 in. (actual) timber placed along the East top edge of the column. (Refer to Figures; 8 to 10, Appendix “A”, Volume I). The North/South spanning horizontal 1 ½ in. diameter pipe passes through the brick masonry column. Viewing West.

PHOTOGRAPH BSE-14:

East and North faces of brick masonry Column 2c. Viewing Southwest. (Refer to Figure 10, Appendix “A”, Volume I).

PHOTOGRAPH BSE-15:

South and East faces of column 2c. Shows the 1 ½ in. diameter pipe penetrating the South face of the column. Viewing Northwest. (Refer to Figures; 8 to 10, Appendix “A”, Volume I).

Column 3c – Photographs; BSE-16 to BSE-22

PHOTOGRAPH BSE-16:

Viewing Southwest at the entry to Basement Rooms; B13 and B14. (Refer to Figure 6, Appendix "A", Volume I). Column 3a is located left of centre of the photograph and adjacent to the South exterior foundation wall. Column 3c is located approximately at the centre of the photograph and Column 3d is located right of centre of the photograph.

PHOTOGRAPH BSE-17:

South and East faces of brick masonry Column 3c. Viewing Northwest.

PHOTOGRAPH BSE-18

Clay brick deterioration at the top South and East faces of the brick masonry Column 3c. Viewing Northwest.

PHOTOGRAPH BSE-19:

Clay brick deteriorated at the bottom portion of the North and the East faces of the brick masonry Column 3c. Viewing Southwest.

PHOTOGRAPH BSE-20:

Deteriorated clay bricks at the top North face of the masonry Column 3c. Viewing Southwest.

PHOTOGRAPH BSE-21:

Deteriorated clay bricks West and South faces of brick masonry Column 3c. Viewing Northeast.

PHOTOGRAPH BSE-22:

Deteriorated clay brick top portion of West and South faces of Column 3c.

Column 3d – Photographs; BSE-23 to BSE-26

PHOTOGRAPH BSE-23:

South and West faces of brick masonry Column 3d. Viewing Northeast. Also shows the existing steel shore (“jack post”) adjacent to the West face of the column. A decision was made to place an additional “jack post” adjacent to the East face of the column for support of the East/West spanning timber beam. This decision was made on the assumption that the timber beam is not a continuous beam but rather a simple beam that spans from Column 2c to 3c and from 3c to 4c. Deteriorated bricks can be seen on the South face. Viewing Southwest.

PHOTOGRAPH BSE-24:

South and East elevations of Column 3d. Viewing Southwest. Shows deterior-ated bricks on both faces.

PHOTOGRAPH BSE-25:

Deteriorated bricks top of East face of Column 3d. Viewing West.

PHOTOGRAPH BSE-26:

Deteriorated clay bricks East and North face of brick masonry Column 3d.

Column 4a – Photographs; BSE-27 to BSE-33

PHOTOGRAPH BSE-27:

West face of clay brick masonry Column 4a. (For location, refer to Figure 6, Appendix “A”, Volume I).

The brick masonry column appears to be a replacement of an original brick masonry column. The brick masonry column is poorly constructed. The brickwork is distorted, the mortar joints are of an excessive width and the column is not plumb. Viewing East adjacent to the South foundation wall in Room B13.

PHOTOGRAPH BSE-28:

The top West and North faces of Column 4a. Shows slate shingles used as shims between the underside of the timber beam and the top of column. Viewing Southeast.

PHOTOGRAPH BSE-29:

Top West face of Column 4a. Shows the timber beams bearing on slate shingles at the top of the column.

PHOTOGRAPH BSE-30:

The basement window of Room B14 located adjacent to the Southwest corner of Room B-14. Evidence of water leakage flowing through the window opening and down the face of the foundation wall.

PHOTOGRAPH BSE-31:

The original basement window is lying on top of the foundation wall. The window opening is sealed with plywood sheathing. Two PVC conduits penetrate the plywood sheathing. Viewing South.

PHOTOGRAPH BSE-32:

Remnants of snow piled against the South face of the building in front of basement window at the Southeast corner of Basement Room B14. Viewing West on 22 March 2014.

PHOTOGRAPH BSE-33:

Remnants of snow piled against the Southeast face of the building. Viewing Northeast on 22 March 2014.

Tab 3: Roof Framing

(Photographs; RF-1 to RF-13)

PHOTOGRAPH RF-1:

Timber roof truss on Gridline 7. (The Southern end of the roof truss is located over the West end of Room 310 - third floor Press Room). The timber roof truss has a clear span across the building with bearing on the top of the North and South exterior walls. The green coloured diagonal members of the roof truss were installed during the 1980's restoration work. The green colour is the result of the preservative treatment. Viewing Southeast in the mid span of the truss.

PHOTOGRAPH RF-2:

The top chord of the roof truss on Gridline 7. A continuous crack exists at approximately mid depth of the top chord of the roof truss. The top steel bolt of the steel plate connection is located at the centre of the wide crack in the top chord. The bottom bolt is located near the bottom of the top chord. Viewing Southeast.

PHOTOGRAPH RF-3:

Top chord with steel bolted connection of roof truss on Gridline 3. Viewing Southeast. A wide continuous crack exists at mid height of the top chord. The top bolt passes through the crack. The bottom bolt is close to the bottom edge of the top chord. A structural analysis should be conducted on the truss including the connections as the connections may have inadequate strength because of bolting through the wide cracks and inadequate edge distance. Viewing Southeast.

PHOTOGRAPH RF-4:

Close-up of the steel connection shown in Photograph RF-3. Shows the wide continuous crack located at mid height of the top chord of the truss. Viewing Southeast.

PHOTOGRAPH RF-5:

An example of continuous cracking at mid height along the top chord of Roof Truss 3. Viewing Southeast.

PHOTOGRAPH RF-6:

Top chord of roof truss on Gridline 3. Viewing Southwest. Shows new roof deck (green colour) bearing on an existing 3 ½ in. deep x 4 in. wide roof rafter (located above the top chord of the roof truss) with its South end bearing on an East/West spanning original roof beam.

PHOTOGRAPH RF-7:

New roof rafter located 2 ft. 3 in. East of the roof rafter shown in Photograph RF-6. This roof rafter consists of three 2 in. x 4 in. (nominal) timber studs that replaced the original 3 ½ in. deep x 4 in. wide rafter. Viewing South adjacent to the roof truss on Gridline 3.

PHOTOGRAPH RF-8:

Left of centre of the photograph is an original roof rafter located 2 ft. 3 in. East of the new rafter shown in Photograph RF-7. Shows the 1980's replacement green coloured roof deck and the 1980's replacement green coloured rafter shown in Photograph RF-7.

PHOTOGRAPH RF-9:

Two roof rafters spanning North/South located West of the roof truss on Gridline 3. Particular attention should be given to the notched end (North end) of the closest rafter and the notched end of the roof rafter located approximately 2 ft. 3 in. West of the closest roof rafter. (Refer to Photograph RF-10, Appendix “B”, Volume II).

PHOTOGRAPH RF-10:

Shows the failed notched end of the 3 ½ in. deep x 4 in. wide roof rafter. Viewing West. **Within time, collapse is imminent.**

PHOTOGRAPH RF-11:

Extensive water staining to original roof deck and original North/South spanning roof joists. The roof joists are located at 2 ft. 4 in. centre to centre. The roof joists measure 3 ½ in. wide x 8. deep (actual). Viewing West from the central attic area adjacent to roof tops on Gridline 5.

PHOTOGRAPH RF-12:

Evidence of long history of water staining on the roof framing components bearing on the top chord of the roof truss on Gridline 5 located at approximately mid span. Viewing Northeast.

PHOTOGRAPH RF-13:

Structural steel beam spanning East/West across the Southern end of Room 301. The beam is bearing on new clay brick masonry construction. The steel beam and the new brick masonry construction is part of the 1980's major restoration construction. Viewing Southwest.

Tab 4: Deflected Floor East Side of West Gallery of Legislative Assembly Room

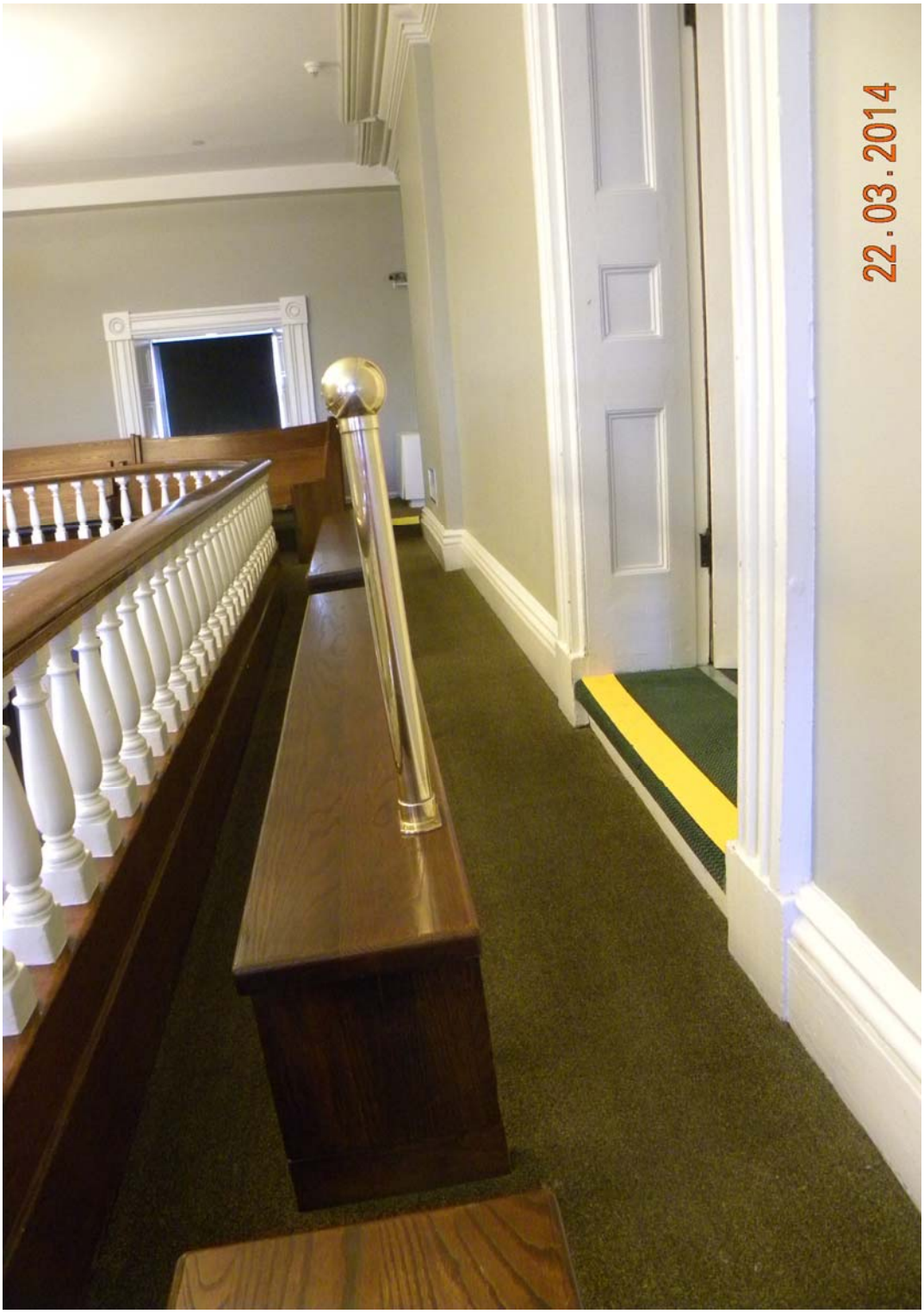
(Photographs; GF-1 to GF-4)

PHOTOGRAPH GF-1:

East end of third floor corridor and entrance to the gallery of the Legislative Assembly (Room 311).

PHOTOGRAPH GF-2:

West side of gallery of Legislative Assembly. Viewing South. Shows the posts and guardrail at the door entrance to the gallery are leaning East. At the entrance to the gallery, the floor of the gallery has deflected down at its East end 2 15/16 in.



PHOTOGRAPH GF-3:

Close-up of third floor entrance to the gallery. Shows the posts with horizontal guard leaning Eastward. The floor of the gallery at this location has deflected 2 15/16 in. over its width. (East end deflected 2 15/16 in. lower than the West side at the entrance). Viewing South.

PHOTOGRAPH GF-4:

Viewing West side of gallery with its third floor entrance. Shows the two brass posts with the brass horizontal guardrail shown in Photographs; GF-1 to GF-3, Appendix “B”, Volume II. Two columns support the East end of the gallery floor. There is no evidence of cracking in the wall and ceiling finishes below. The cause of the gallery floor deflection is unknown. Further investigation is required.

Tab 5: Deflected Floor of East Gallery of Confederation Room

(Photograph GF-5)

PHOTOGRAPH GF-5:

View of the South half of the Confederation Room (301). Viewing South. The gallery area in question is left of centre of the photograph.

Tab 6: Displaced Sandstone Units of Stone Masonry Arches of North and South Porticos

(Photographs; SM-1 to SM-6)

PHOTOGRAPH SM-1:

South elevation of Province House, PEI. Viewing North on 17 September 2012.

PHOTOGRAPH SM-2:

Central stone masonry arch of the portico, South elevation. Viewing North on 23 March 2014. Shows displaced sandstone units of the masonry arch as well as displaced sandstone units above the arch.

PHOTOGRAPH SM-3:

Structural steel member installed October 2013 along the backside of the central stone masonry arch of the portico, South elevation. Viewing Southeast on 5 October 2013. (Refer to Cowie Engineering structural Drawing S-1R of the "Temporary Stabilization and Selected Masonry Restoration". design drawings.

PHOTOGRAPH SM-4:

Gypsum board encased structural steel member shown in Photograph SM-3. Viewing Southwest on 22 March 2014.

PHOTOGRAPH SM-5:

Province House, PEI, North elevation showing three stone masonry arches of the portico. Viewing South on 17 September 2012.

PHOTOGRAPH SM-6:

Displaced sandstone units above the West stone masonry arch of the portico on the North elevation.