

Walter Reed Buildings 31 & 84 - Structural Assessment



Building 31 North Elevation



Building 84 North Elevation

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Prepared for

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INTRODUCTION

Silman has been retained to perform a structural assessment of Buildings 31 & 84 on the Walter Reed Army Medical Center (WRAMC) historic campus (see Figure 1). The original dates of construction are 1921 for Building 31 (Warehouse) and 1942 for Building 84 (Equipment Shed). Both structures were built within the period of the significance for the WRAMC Historic District (1909-1956); however, the Master Plan categorizes them as tertiary structures.

As part of the redevelopment of the campus Buildings 31 and 84 are currently planned for either relocation or demolition to accommodate topographic changes and improvements along Aspen Street NW. The purpose of this report is to summarize the existing structural systems, comment on existing conditions, and discuss the feasibility of moving the structures to a different location on the site.



Figure 1 Aerial View of Site Looking South

STRUCTURAL ASSESSMENT

At the beginning of the project Silman was provided with a draft of the “Buildings 31 & 84 – Background and Historic Documentation” Report, which was produced in July 2019 by EHT Tracerics. A drawing from the 1941 Building 31 addition was also reviewed. Other relevant historic documents are referenced within the EHT Tracerics report, but they have not been provided to Silman.

A review of available documents was followed by a visual survey of accessible elements. Representatives from Silman visited both buildings in July 2019. The site visit allowed for documentation of structural components and a limited assessment of their existing conditions. Evidence of previous modifications, material deterioration and foundation problems were all noted.

Building 31

Building 31 was originally constructed in 1921 as an oil storehouse (see Figure 2). Additions dating to 1941 and 1971 brought the structure to its present size. The building is one-story and rectangular in plan, with dimensions of about 120 feet in the east-west direction and 20 feet in the north-south direction. A grade change occurs over the length of the building exposing a concrete foundation wall on the west end of the building. The grade change accommodated truck deliveries and included an elevated dock for deliveries.

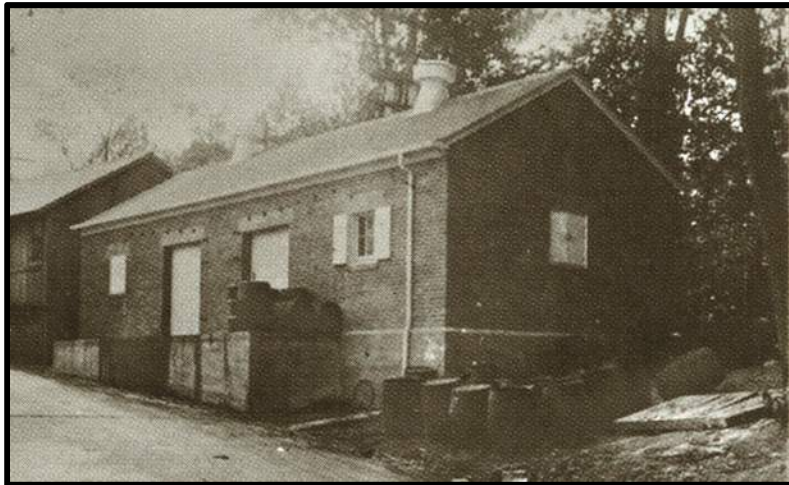


Figure 2 Building 31 Photo from 1922

The building can be divided into three distinct areas (see Figure 3):

- At the west end of the building a 20-foot-long open storage shed that appears to date to 1971.
- Near the center the original 1921 structure, which is about 50-foot-long.
- At the east end of the building a 50-foot-long addition dating to 1941.

The structure typically consists of load bearing masonry walls with wood trusses. The open storage shed structure consists of wood posts with wood trusses.



Figure 3 Building 31 Period of Construction

Foundations

Description: The foundations for Building 31 appear to be continuous concrete footings below the exterior masonry walls. Drawings from the 1941 addition show a 6-inch thick slab on grade and 1'-8" wide concrete footings 2'-6" below grade at the exterior walls (see Figure 4). It is likely that similar foundation construction is present at the other periods of construction. Reinforced walls were likely used where interior floors were higher than exterior grades. At the open storage shed, the foundation walls are CMU masonry. At the north elevation there is a concrete platform and steps to address the sloping grade.

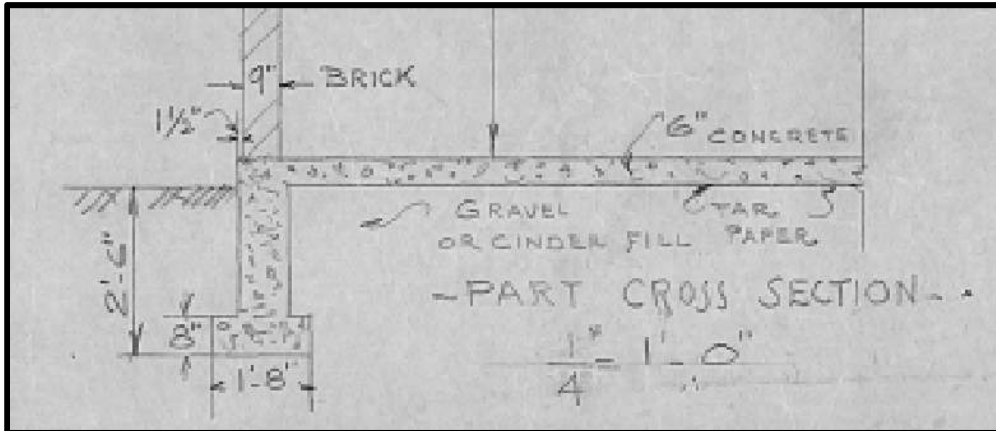


Figure 4 Building 31 Foundation Section from 1941 Drawings (2019 EHT Traceries Report)

Assessment: Foundation elements were largely hidden and could not be observed. Where visible, foundations were in fair to poor condition. Spalling, cracking and weathering of the concrete platform and exposed foundation walls were observed (see Figure 5). Some weathering and loss of shell thickness was evident at the open storage CMU foundation walls.



Figure 5 Spalling and Cracks at 1921 Foundation Wall (Left) and Cracking/Spalls at North Platform

Walls

Description: The original 1921 wall construction is made up of two-wythe (about 9 inches) brick masonry. At the north elevation of the original building it appears that many of the original openings have been partially infilled. Openings in the envelope have 12-inch deep concrete lintels (see Figure 6).



Figure 6 Partially Infilled Opening and Concrete Lintel at Original 1921 Building

The 1941 wall construction consists of one-wythe (about 4 inches) of brick masonry at the exterior and one-wythe (about 4 inches) of CMU at the interior, with brick headers tying the two assemblies together (see Figure 7). Openings in the masonry walls appear to have steel angles serving as lintels. There is a cold joint in the masonry wall between the 1921 and 1941 construction.

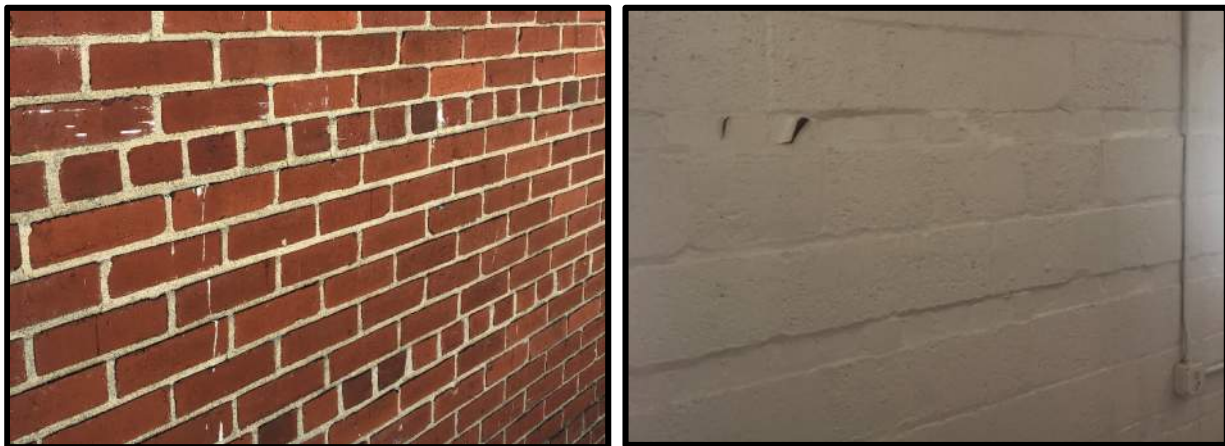


Figure 7 Wall Construction for 1941 Addition at Brick Exterior (Left) and CMU Interior (Right)

The 1971 shed consists of regularly spaced wood posts supporting girders that carry the load from the roof trusses (see Figure 8).



Figure 8 Wood Framing at 1971 Open Storage Shed

Assessment: Masonry walls are in fair condition. Efflorescence was noted in localized areas and organic growth/mortar loss was evident in walls near grade, likely due to rising damp. Damage was especially prominent near downspouts (see Figure 9).



Figure 9 Mortar Loss and Organic Growth Near Grade

At the 1921 building some masonry cracking and concrete spalling was evident at the inside face of the wall around the lintels (see Figure 10).



Figure 10 Concrete Spalling at Top of Lintel and Cracking Below

Roof Framing

Description: The gable roof is framed by regularly spaced wood trusses with wood sheathing and asphalt shingles above. The framing varies slightly based on the period of construction. At the 1921 and 1941 buildings the trusses appear to be made up of 2"x6" (actual) top and bottom chords with vertical braces at the mid-span at 30 inches on-center. Trusses bear on 2" thick sill plates anchored to the top of the masonry wall (see Figure 11).

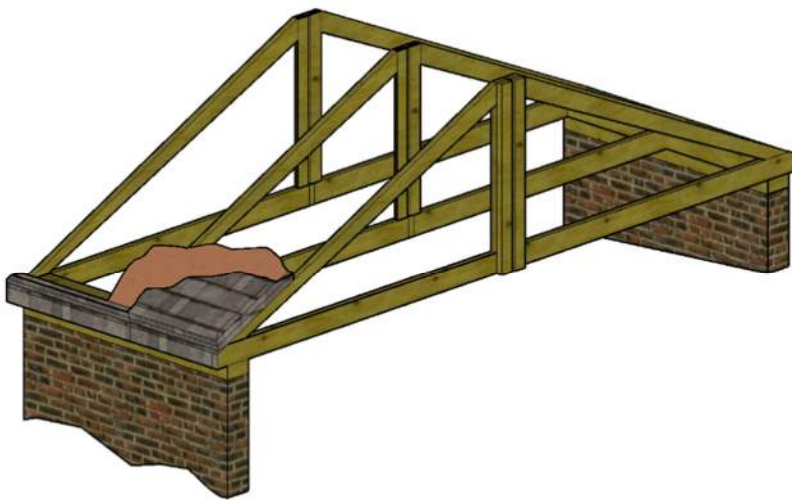


Figure 11 Typical Truss Framing at 1921 and 1941 Roofs

The 1971 shed trusses appear to consist of 2x6 (nominal) members spaced at 24 inches on-center. At mid-span a horizontal bridging member braces the bottom chord of the truss. Plywood roof sheathing above the trusses supports the wood asphalt shingles.

Assessment: Much of the roof framing is obscured by ceiling finishes. Where it could be observed the framing appeared to be in poor to fair condition. There are signs of moisture infiltration at the roof, such as water stains on ceilings, which likely corresponds to wood deterioration in the roof framing.



Figure 12 Water Staining at Dropped Ceiling Tiles

Building 84

Building 84 was originally constructed in 1942 as a wagon shed and is currently used as an equipment shed. An addition at the east end was constructed in the 1970s and appears to have most recently been used as a salt storage shed. The building is one-story and roughly rectangular in plan, with dimensions of about 120 feet in the east-west direction and typically 20 feet in the north-south direction.



Figure 13 Building 84 Period of Construction

The building can be divided into two distinct areas (see Figure 13):

- At the west end the original 1942 structure, which is about 90-foot-long.
- At the east end the shed addition from the 1970s, which is about 30-foot long.

The original structure typically consists of load bearing masonry walls/piers with wood trusses. The storage shed consists of concrete knee walls with three steel portal frames above supporting wood trusses and rafters.

Foundations

Description: The foundations for the original Building 84 structure consist of a slab on grade. Wall footings are not visible but are likely concrete construction given the period of construction. At the addition there are concrete knee walls up to a few feet above grade.

Assessment: Where foundation elements are visible, they are in poor to fair condition. A portion of the north foundation wall is visible at an exterior ramp and has significant concrete loss due to weathering. Cracking was noted at several locations at the slab on grade (see Figure 14).



Figure 14 Cracks and Minor Spalling at Slab on Grade

Spalling and cracking was also noted in the concrete foundation walls at the shed where the salt has likely accelerated deterioration due to increased chloride exposure. Cracking is prevalent at the interface with the steel frame where rusting of the steel has displaced the surrounding concrete (see Figure 15).



Figure 15 Spalling of Concrete Foundation Walls at Interface with Steel Frame

Walls

Description: At the original 1942 structure the north elevation consists of 2-wythe (about 9 inch) load bearing brick masonry walls/piers with wood girders spanning between openings. Many of these original openings have since been infilled with 2x8 wood stud wall construction (see Figure 16). At the south elevation it appears that most of the wall is concrete framed where it is retaining soil from the adjacent hillside. The remaining walls appear to be a mix of CMU partitions at the interior and composite CMU and brick end walls.



Figure 16 Brick Masonry Piers with Wood Infill at North Elevation

At the shed, the structure consists of steel frames with tube columns (6x6) and wide flange beams (W10s). Wood stud walls with sheathing infill between steel columns, but are not load bearing (see Figure 17).



Figure 17 Steel Frame and Wood Infill at Shed Addition

Assessment: The walls at Building 84 are in poor to fair condition. The south elevation above grade is covered in dense vegetation and only limited observations could be made from the exterior. At the original structure step cracking was noted at isolated locations, likely due to foundation shifting and settlement due to the site

grading (see Figure 18). At many locations past anchors and penetrations in the masonry have been patched with incompatible materials causing further distress.



Figure 18 Step Cracking at Masonry Wall

The steel framing and wood infill at the shed addition is in poor condition. Significant rusting has caused section loss of both beam and column members (see Figure 19). The wood plywood sheathing has staining especially near the base at the concrete knee walls. Based on observed conditions it is likely the underlying wood studs and sill plates have also experienced section loss.



Figure 19 Rust at Base of Steel Tube Column

Roof Framing

Description: The gable roof of the original 1942 structure is framed by wood trusses at 24" foot on-center with wood sheathing and asphalt shingles above. The trusses appear to be made up of 2"x6" (actual) top and

bottom chords with 1"x6" (actual) vertical and diagonal braces. Trusses bear on double 2" thick sill plates anchored to the top of the masonry wall (see Figure 20).

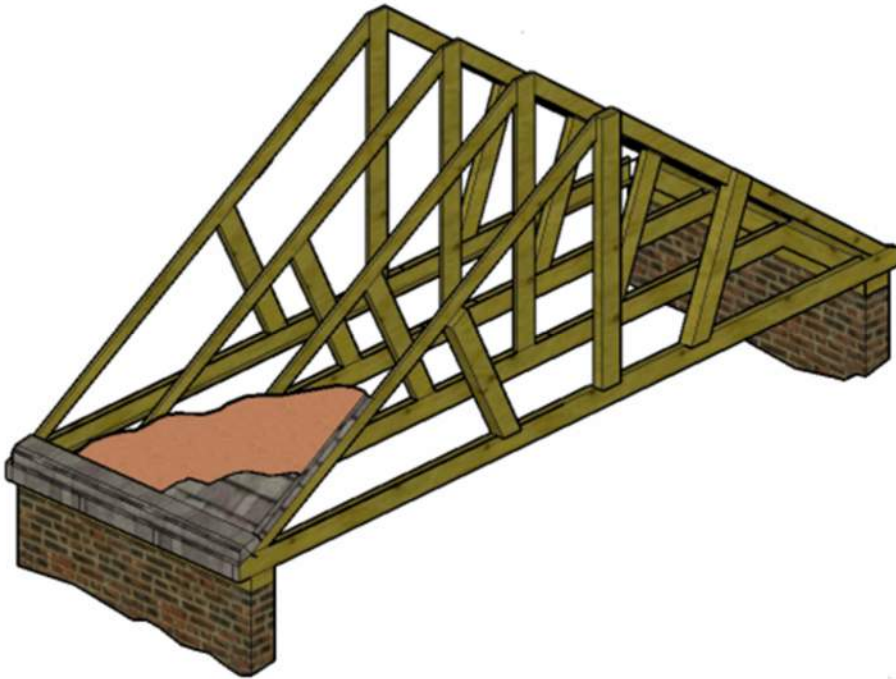


Figure 20 Roof Trusses at Original 1942 Structure

At the shed addition the framing consists of 2x4 (nominal) trusses at about 2 feet on-center at the north end gable. The flat roof at the south end of the shed is framed by 2x8 (nominal) sloped rafters. The roof framing is supported by three lines of steel framing. The wood framing has plywood sheathing and asphalt roof shingles above (see Figure 21).

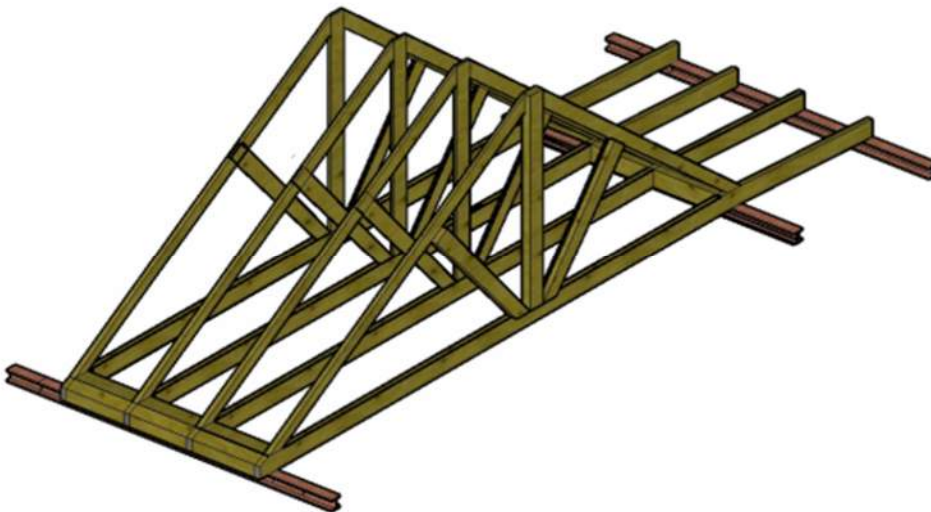


Figure 21 Roof Trusses at 1970s Shed Addition

Assessment: At the original 1942 structure only limited observations could be made. Some signs of moisture infiltration and roof leaks were noted, but no areas of significant distress or material loss were identified. The roof framing, where exposed, is in poor to fair condition.

At the shed structure the plywood sheathing had significant water staining. Members could not be assessed up close, but it appears likely that at least some members have section loss. Some of the 2x4 truss members appear undersized for their span and some have failed (see Figure 22).



Figure 22 Failed Bottom Chord of Shed Truss

RECOMMENDATIONS

In the 2012 “Reuse Plan” put together by the Walter Reed Local Redevelopment Authority both Buildings 31 & 84 are listed as having “fair” integrity, “poor” reuse potential, and “minor” historic significance. Silman’s assessment agrees that from a structural perspective these buildings are in poor to fair condition. Significant work is required for these structures to be adaptively reused. Required structural repairs likely include:

- Concrete patching/crack repairs at foundation elements
- Foundation stabilization
- Masonry wall repointing and crack repairs
- Steel framing replacement/reinforcement and restoration of protective coating
- Wood roof framing reinforcement
- Roof and sheathing replacement

Given the current condition of both buildings they do not appear to be good candidates for moving to a different location on the site. This is especially true for the 1970s era shed additions at both buildings. While a move is likely feasible it may be cost prohibitive. Due to the absence of floor framing, the structures do not have good internal stability once lifted from their foundations, and significant bracing would be needed to achieve the move. After the relocation significant repairs would be needed.