

## 1.0 BUILDING DESCRIPTION

Completed in April 2006, the Village of Cornwall-on-Hudson's Department of Public Works (DPW) Building is a "pole barn" style, wood-framed structure. The exterior plan dimensions measure 184'-3" long and 70'-0" wide, with a 16'-6" eave height. The building exterior cladding consists of a light-gauge ribbed metal siding and a standing seam metal roof. The building's interior space is divided into two areas of use: the DPW's two-story administrative office space, and the DPW's maintenance garage, which comprises a majority of the building total footprint.

## 2.0 AREAS INSPECTED

The interior and exterior areas inspected are as shown on the As-Built drawings, prepared by Tectonic, dated 4/23/10.

## 3.0 EXTERIOR INSPECTION FINDINGS

### 3.1 Foundation

To determine the condition, three test pits were dug at the building exterior, one at the north corner of the west elevation, one at approximately the center of the southern elevation, and the other along the eastern elevation between the first two 12-foot garage bays towards the north of the building.

During the inspection of these test pits, the following conditions were noted:

1. The existing structure was built with a concrete pour strip (serving a spread footing) and below grade wood structural elements exposed to constant moisture through the Item No.4 stone fill layer found between the 12" concrete floor/base slab and the concrete pour strip below. Refer to Detail 2 on Drawing A-4 of the As-Built Drawings.
2. 6" x 8" Glulam posts were observed at all three test pit locations. These posts proceed from the roof line to a 2" x 8" sill plate that is attached to the concrete pour strip. The foundation sill plate anchorage was observed to be comprised of a post-installed, small diameter fastener of an unknown or irregular spacing. The posts are toe nailed into the sill plate with no other form of fastening observed. A 3" thick layer of Styrofoam insulation board was observed to be the only barrier between the earth and wood

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posts (See Photos 1, 2 and 3). No other form of preservative or protective coating was observed on the wooden foundation components.



**Photo 1 - West Elevation, North Corner - Foundation Test Pit**

3. The concrete pour strip/ strip footing appears to have been poured in place against the surrounding soil and no evidence of steel reinforcing was observed. The footing varies in thickness with an approximate maximum depth of 16". The footing was also observed to project irregularly from the exterior face of the building at a width between 12" to 16" and at a bottom depth of roughly 3'-8" to grade. This meets minimum frost depth.
4. In general, there appears to be no substantial evidence of settlement of the foundation. The 1'-0" thick base slab and the continuous concrete pour strip (serving a spread footing) below did not reveal any visible cracking or observable deflection. However, it is advised that the foundation be monitored regularly for settlement and that a detailed geotechnical evaluation be performed.
5. Concentrated loads on the high bay garage door posts are supported by a strip footing that is not adequate to distribute the load to the soil below, based upon test pit inspections and loading evaluations conducted.



Photo 2 - Southern Elevation - Foundation Test Pit

### 3.2 Geotechnical Assessment

While not a part of the scope of the work within the terms of the contract, Tectonic, during the course of the structural evaluation and code-compliance review, has also performed a limited geotechnical assessment of the subsurface soil condition. Subsurface soil conditions were assessed based on our review of the following information found in the Village files:

- Soil Investigation and Report for the Proposed Village Garage, prepared by William G. McEvelly, P.E., LS dated August 1973 (McEvelly Report)
- Letter to Mr. Robert Gilmore, DPW Superintendant from James H. Fitzsimmons, P.E. – Dufresne-Henry Engineers and Landscape Architect, P.C. regarding the New DPW Garage dated May 31, 2005 (Dufresne-Henry Report).
- Daily Field Report prepared by Mark Clark, Technician, of Advance Testing regarding the New DPW Garage dated June 7, 2005 (Advance Testing Report).

The McEvelly Report and the Dufresne-Henry Report both conclude that poor soils exist at the site and recommend that pile foundations be used to support the building and floor slab. The Advanced Testing Report presents the results of Static Cone Penetrometer tests at the footing subgrade elevation and indicates a bearing capacity of 2.5 to 3.0 tons per square foot.



**Photo 3 - Test Pit at East Elevation between 12-foot bays**

Additionally, the three test pit excavations were made by the Village's DPW to allow us to observe the existing foundation conditions along the building wall and at a post located on one side of a garage bay opening where concentrated loads are the greatest. The footing conditions at all locations were similar and as described in Section 3.1 Foundation of this report.

The subsurface conditions as described in the reports reviewed are typically not suitable for support of conventional shallow foundations and we agree with the recommendations for using pile supported foundations. However, a shallow foundation; if lightly loaded and properly sized, may provide adequate bearing stability, intolerable long term settlement could result.

The footing dimensions were difficult to determine as it was apparent that the footings were constructed in open excavations rather than within formwork. It appears that the footings are roughly as described in the Dufresne-Henry Report ("a 2-foot wide, 1-foot thick strip footing around the building perimeter"). Based on our analysis the strip footing was determined to provide suitable bearing stability for the typical lightly loaded walls. Bearing stability however could not be confirmed for the footings supporting the posts that carry concentrated loads at the sides of each garage bay opening.

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As previously stated, settlement needs to be considered in addition to bearing stability.

Based on our observations the building and slab have not experienced any significant differential settlement. Based on the subsurface conditions described as miscellaneous fill overlying a thick deposit of highly compressible silt and peat, it is our opinion that settlement has and will continue to occur. Both differential settlement and total settlement are difficult to estimate as only one boring was performed within the building footprint and no undisturbed samples of the compressible organic soils were tested for consolidation.

### 3.3 Components and Cladding

The exterior wall cladding was observed to be comprised of corrugated, light gage steel siding, fastened to 2" x 4" girts by machine screws at regular intervals. The 2"x4" girts appear to be vertically spaced at 2'-0" on center.

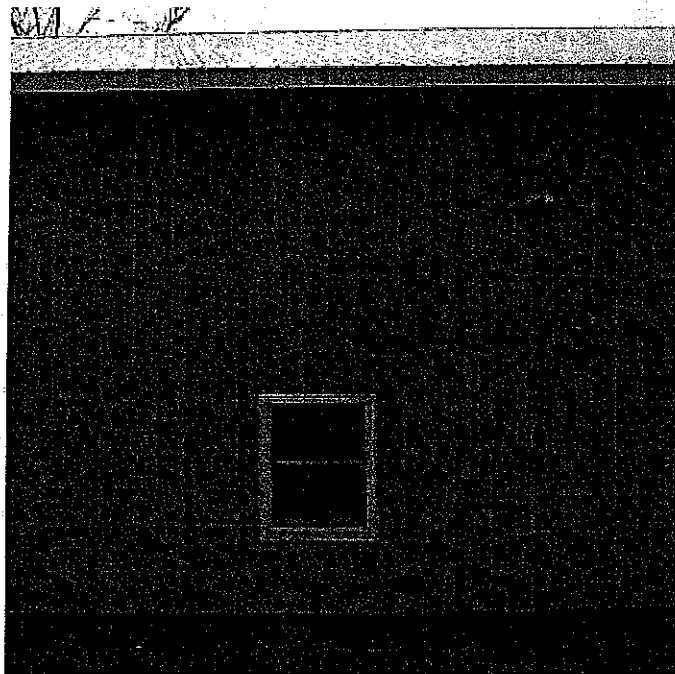


Photo 4 – Typical corrugated Metal Siding and Roofing

The exterior roof cladding is comprised of a light gage standing seam metal roof supported by 2"x4" wood purlins spaced at 2'-0" on center, which are supported by the prefabricated roof trusses beneath. No sheathing backing the roof cladding was found and no additional inspection of the roof was conducted during the limited visual inspection of the exterior cladding.

The eave fascia and soffits appear to be aluminum and appear to be properly fastened.

### 3.4 Windows and Doors

The windows and doors of the DPW Building were visually inspected, documented and reviewed for general code compliance.

The key items or areas of non-conformance observed are as follows:

#### MEANS OF EGRESS (Chapter 10, NYS Building Code)

##### Office (Building Use B)

- DOORS – 1003.3.1 .1

The height of the door 102D (first floor, exterior door at corridor, eastern elevation – see Drawing ) does not meet the following requirements:

- Minimum door height of 80 inches. Actual height of Door 102D: 78 inches.

##### Maintenance and Storage (Building Use S1)

- DOORS – 1003.3.1 .1

The height of the door 104C (first floor, exterior door in corridor, eastern elevation – see Drawing A-1) does not meet the following requirements:

- Minimum door height of 80 inches. Actual height of Door 104C: 78 inches.

#### ACCESSIBILITY (Chapter 11, NYS Building Code)

- ACCESSIBLE ENTRANCES – 1105.1

The existing building entrances do not conform to the requirement of “at least 50 percent, but not less than one entrance” providing a means of

accessible egress. The existing concrete sidewalk around these two doors provides a vertical obstacle preventing access.

A detailed and itemized table regarding code compliance can be found on the As-Built Drawing G-1. Drawing G-2 contains door and window schedules as well as a glazed area table. The locations of the door and windows are provided on the A-Series (Architectural) drawings of the as-built drawing set.

## 4.0 INTERIOR INSPECTION FINDINGS

### 4.1 General Findings

Some of the more substantial general architectural code compliance issues that were determined from Tectonic's site investigations of the DPW Building are as detailed below:

#### SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY (Chapter 4, NYS Building Code)

- HAZARDOUS MATERIALS – 414.2

Hazardous material control areas must be setup, in accordance with the number and quantities listed in Table 414.2.2 and Table 307.7.

#### TYPES OF CONSTRUCTION (Chapter 6, NYS Building Code)

- CONSTRUCTION TYPE – TABLE 601

In order to comply with the square footages currently allotted to each of the building uses; B and S1, the building construction would have to be qualified as Type VA, a protected wood structure. This requires 1 hour ratings on most of the building elements, bearing and non-bearing walls, structural frame, and the roof and floor construction. Some of these items may meet the UL ratings for 1-hour resistance; however, a full assessment would have to be performed to ensure that they all comply. In its current state, the building must be classified as Type VB; an unprotected wood structure. However, the area for the S1 usage is required to be reduced from the current value of 11,200 square feet to the code-limited 9,000

square feet. The office usage (Building Use B) meets the square foot requirements regardless of the construction type.

#### FIRE-RESISTANCE-RATED CONSTRUCTION (Chapter 7, NYS Building Code)

- OCCUPANCY SEPARATION (FIRE BARRIER) – 706

The existing building occupancy classification is B - Business and S1-Moderate Hazard Storage in a separated mixed-use building. The New York State Building Code requires that these occupancies must be separated by a fire barrier with a minimum 3-hour rating.

#### INTERIOR ENVIRONMENT (Chapter 12, NYS Building Code)

- ATTIC SPACE VENTING – 1202.2

There is no attic venting present above the eaves. At least 50% of the required ventilation must occur at least 3 feet above the eave.

#### PLUMBING SYSTEMS (Chapter 29, NYS Building Code)

##### Office (Building Use B)

- REQUIRED PLUMBING FIXTURES – TABLE 2902.1

Presently, the office area has no drinking fountain equipped – at least one is required.

##### Maintenance and Storage (Building Use S1)

- REQUIRED PLUMBING FIXTURES – TABLE 2902.1

There are no shower facilities in the S1 usage area – at least one is required.

## 4.2 Interior Accessibility

The interior of the DPW Building was carefully evaluated to determine its compliance with The 2002 New York State Building Code in terms of interior accessibility requirements for each building use rating. The areas of compliance and non-compliance are as follows:

- **STAIRWAYS – 1003.3.3**

### Office (Building Use B)

The existing stairway to the second floor office space does not meet the following requirements:

- Handrail height
- Handrail extensions
- Exit stairway enclosure
- 1 Hour exit stairway fire rating (Also non-compliant for NYS BC 1005.3.2)
- The knee wall at the second floor does not meet the minimum guardrail height

### Maintenance and Storage (Building Use S1)

The existing stairways to the mezzanine spaces do not meet the following requirements:

- Handrail extensions
- Riser height
- Gaps between the stair stringer and sidewall were found to exist, these spaces should be enclosed.

- **ELEVATORS – 1104**

### Office (Building Use B)

An accessible means of egress is not required to the 2<sup>nd</sup> floor offices since the aggregate area of the 2<sup>nd</sup> floor office space is less than 3,000 square

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feet. Please see refer to Section 1104 of the 2002 New York State Building Code and Drawings G-1 and G-2 of the As-Built set for additional information.

The Handi-Lift currently in place meets the lone requirements for an accessible lift except for the door operation. An automatic opening door must be installed.

### 4.3 Interior Framing

The interior framing of the building is based on a "pole barn" style. 6" x 8" glue-laminated or Glulam wood posts were found to be spaced at approximately 8'-0" on center horizontally. 2"x8" studs at 2'-0" on center are located between the posts with 2"x4" girts attached to the exterior face of the posts and studs at 2'-0" on center vertically. Two (2) 2"x12" LVLs straddle the posts and studs, running along the top of the wall framing. 2"x8" diagonal blocking has been observed to exist; however, it does not appear to add substantial lateral bracing to the framing (Please see Detail 2, Drawing A-4).

At the typical rollup door sections, additional framing elements were observed running between the bays. In addition to the (2) 2"x12" LVLs at the top of the walls, two more 2"x12" LVLs appear to serve as the door headers, with (2) 2"x10" blocking members running in between (See Detail 3, Drawing A-4).

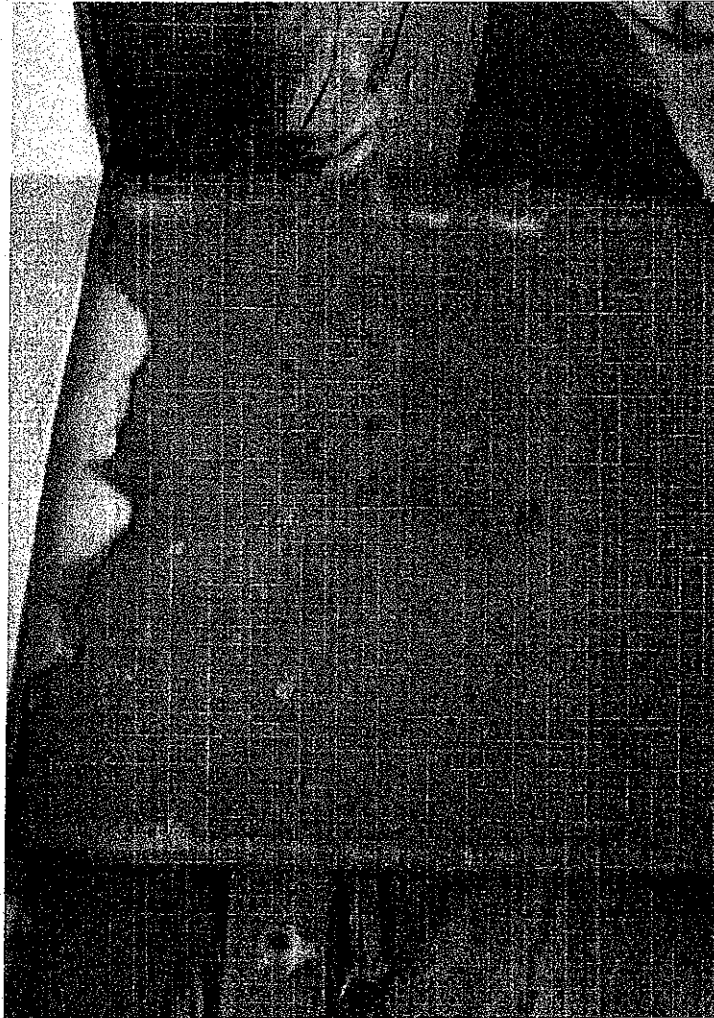
A number of assumptions have been made regarding the wood species, grading and construction type that was not discovered during our probes and review of the documentation provided by the Village of Cornwall-on-Hudson. It may not be possible to ascertain the exact properties of the framing members without extensive testing. We believe our assumptions provide a reasonable level of conservatism for our analysis and the actual capacity of the members may be lesser or greater depending upon the actual conditions.

During the inspections and evaluations, the following structural conditions were noted:

1. The typical 2x8 wall studs at 24" o.c. are inadequate to support the design loads.

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2. The double 2x12 LVL header system, (2) 2"x12" LVLs, is inadequate to support the load over both the 12' and 14' wide doors.



**Photo 5 – Typical 2"x12" LVL connection to 2"x8" stud.**

3. The typical double 2x12 LVL header around the building is adequate to support the load away from the garage doors; however, the connection to the studs is inadequate. The connections were found to be made by 16d common nails, (8) eight nails on either side (inside and outer – 16 nails total).
4. The 6X8 glulam jamb post is inadequate to support the load at the garage door openings, and the connection to the post is inadequate to transfer the

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load. Again, utilizing only common nails – no lag screws or through bolts were observed during our investigations.

5. There is no adequate code recognized means of lateral load transfer, roof diaphragm, or shear walls.

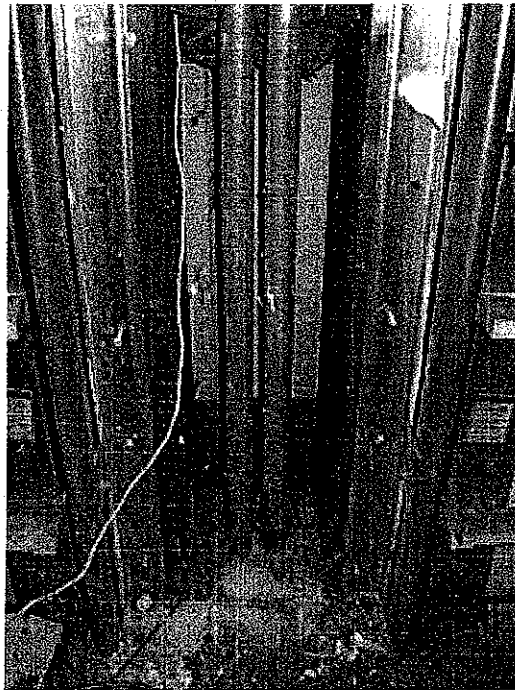


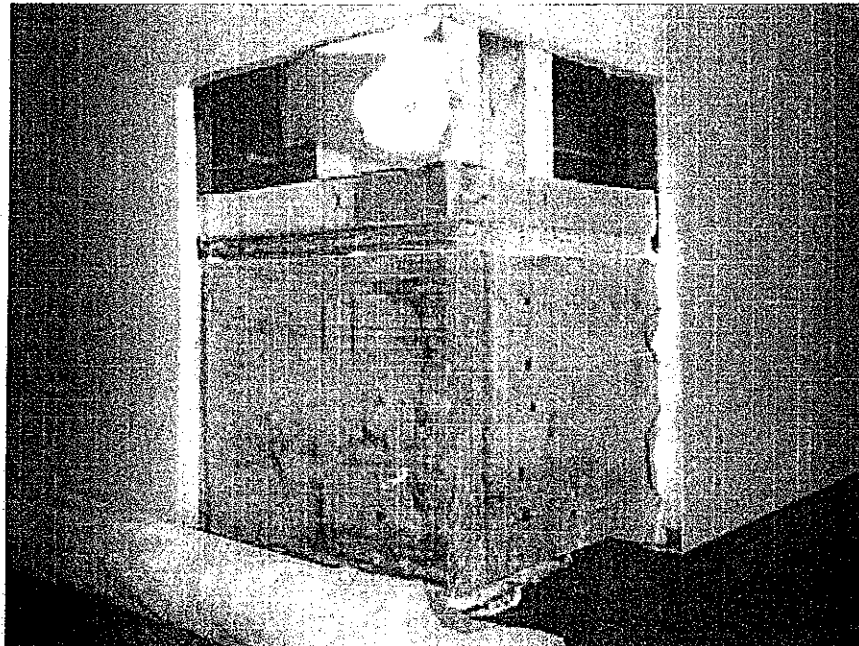
Photo 6 – 6"x8" Glulam posts at west garage doors

6. A portion of the framing at the west mezzanine is inadequate, including the double 2x12 headers and the stud wall supporting the cantilever section.
7. The southern mezzanine double 2"x10" header framing between the lally columns is inadequate for a storage mezzanine design load.
8. Lally columns do not have independent foundations. They bear directly on the 12" floor slab with no positive connection at their respective bases. In addition, some bear directly on the floor slab construction joints.

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**Photo 7 – Exposed southwest corner of South Storage Mezzanine**

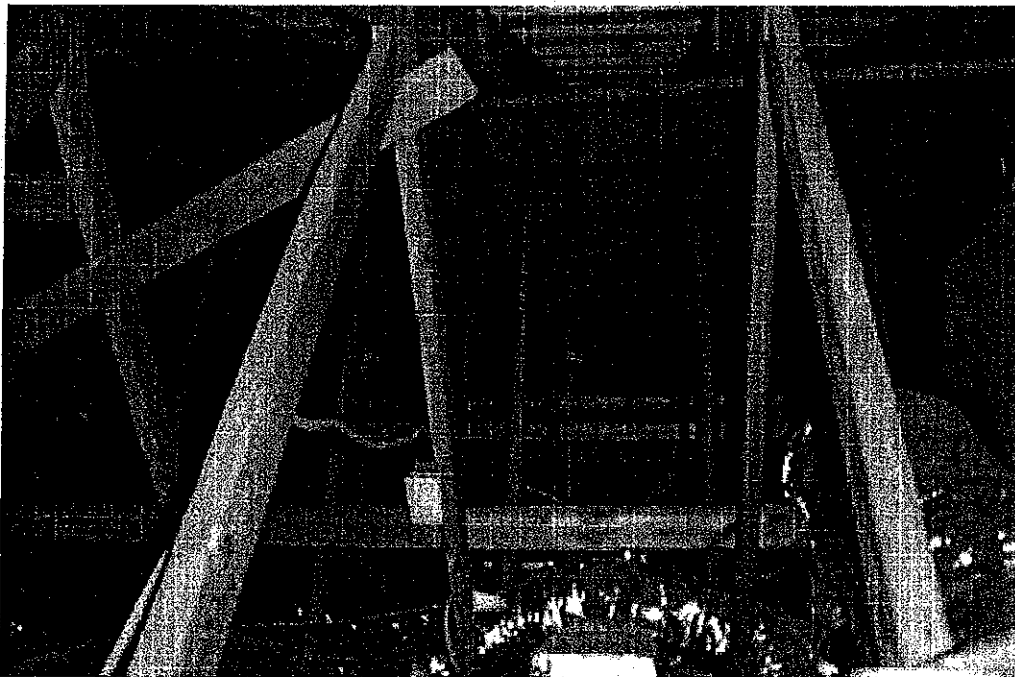


**Photo 8 - Exposed southwest corner of West Storage Mezzanine**

**5.0 ROOF FRAMING INSPECTION FINDINGS**

The roof framing was found to consist of pre-engineered wood trusses spaced at approximately 2'-0" on center. During the inspection, the roof truss components that were accessible were measured for verification with the information provided by the Village. The following conditions were noted:

1. One line of 2"x4" bracing was found to be non-continuous during the inspection of the existing prefabricated roof trusses. This is not installed per the original truss manufacturer's specification. In addition, there are four more bracing lines needed to address the wind uplift condition on the truss.
2. A positive connection was determined to be provided from each truss to either a glulam post or 2"x8" wall stud and is sufficient to resist the uplift forces.
3. No underlying sheathing was observed below the exterior corrugated metal roofing.



**Photo 9 - Roof truss framing as taken from Attic facing west, near 2nd floor Office access stairs.**

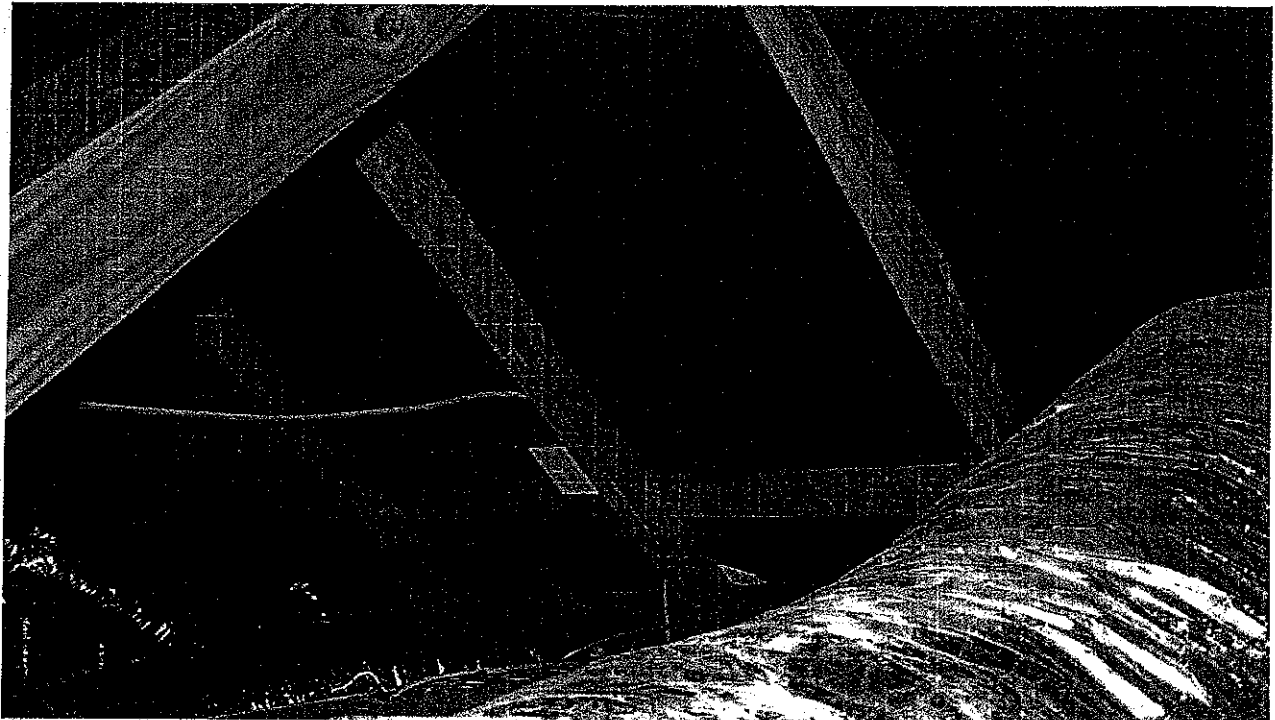


Photo 10 - Roof truss framing as taken from Attic facing northwest.

## 6.0 RECOMMENDATIONS

Tectonic recommends that the Village carefully review the As-Built drawings and this report before proceeding with any additional investigation, remediation, and/or modifications.

In addition, Tectonic recommends the following:

1. The building's structural system, including its foundation be reinforced to support all loads in compliance with the New York State Building Code. The primary concern is the lateral force resisting system be addressed as soon as possible. The connections for the support members should be re-designed.
2. Continuous monitoring of the building for short term and long term settlement.
3. A fire separation barrier between the two building uses should be constructed.

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4. Per the New York State Department of State Division of Code Enforcement and Administration's request, an inspection of the DPW Building's electrical wiring system be performed.
  
5. Any other items that the Village deems a concern outside of the scope of this report.

cc: File

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