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August 5, 2024

Michael Taylor, Township Manager
Springfield Township
1510 Paper Mill Road
Wyndmoor, PA 19038

RE: Evaluation of Roof Structure of Four (4) Township Buildings to Support Solar Panels at 1510 Paper Mill Road, Springfield Township, Montgomery County, Pennsylvania
a+ei file # 24.021

Dear Mr. Taylor:

On 7/30/24 I visited the municipal building complex located at 1510 Paper Mill Road in Springfield Township, Montgomery County, Pennsylvania to examine the physical condition and configuration of the roofs of the four buildings shown in Figure 2. to determine the structural capacity of the roof framing under normal live loads, dead loads and the super-imposed load of the solar collection system which you intend to install on these roofs. This evaluation is limited to roof framing and does not include the compatibility of the electrical system with the solar collection system, the capability of the collection system to supply operational power needs, the structural capability of the framework that supports the panels above the roof or any other aspect of the proposed solar collection system.

The buildings are situated on the eastern side of Paper Mill Road, as seen in Figures 1 and 2. Directions referenced in this report are based on Paper Mill being oriented north to south and Hawthorne Lane being oriented east to west.

Building A: Police and Administration: The police and administration building is seen in Figures 2, 3, 4, 5, 6, 7, 8, 9 and 10. The roof of this building is framed with wide-flange steel roof beams and open-web steel roof joists, supported on steel framing and masonry bearing walls, as seen in Figure 5.

The open-web steel roof joists range in depth from ten (10) inches to twenty-two (22) inches. The joists are fabricated with two and one-half (2-1/2)-inch deep seats and are fabricated with steel angle chords and steel web members. The spans of the open-web steel roof joists range from approximately eight (8) feet to thirty-one (31) feet, six (6) inches.

The wide-flange steel roof beams range in depth from ten (10) inches to twenty-one (21) inches. The spans of the wide-flange steel roof beams range from approximately four (4) feet to thirty-four (34) feet.

The roof joists and beams described above support 22-gauge, structural steel decking. Most areas of the roof are constructed with type B steel roof decking. Type B steel roof decking is formed with ribs that are one and one-half (1-1/2) inches deep and spaced six (6) inches on center. The type B steel roof decking spans no more than eighty-four (84) inches between joists or beams. The roof decking of the board room and the remaining areas of the roof are constructed with type N, 22-gauge structural steel roof decking. The type N steel roof decking is formed with ribs that are three (3) inches deep and spaced eight (8) inches on center. The type N steel roof decking spans no more than one-hundred and eight (108) inches between joists or beams. Both types of decking support foam insulation board and a single-ply membrane roofing.

Building B: Public Works Maintenance: The public works maintenance building is seen in Figures 11, 12, 13, 14, 15, 16 and 17. The roof of this building is framed with wide-flange steel roof beams and open-web steel roof joists supported on steel framing and masonry bearing walls, as seen in Figure 12.

The open-web steel roof joists are located in the central section of this building. The open-web steel roof joists range in depth from eight (8) inches to fourteen (14) inches. The joists are fabricated with two and one-half (2-1/2)-inch deep seats and are fabricated with steel angle chords and steel web members. The spans of the open-web steel roof joists range from approximately nine (9) feet to twenty-one (21) feet.

The wide-flange steel roof beams are located in the north, south and west wings of the building. The wide-flange steel roof beams range in depth from ten (10) inches to twenty-one (21) inches. The spans of the wide-flange steel roof beams range from approximately eight (8) feet to fifty-two (52) feet, eight (8) inches.

The roof joists and beams described above support structural steel decking. The roof of the central portion the building is constructed with type B, 22-gauge, steel roof decking. Type B steel roof decking is formed with ribs that are one and one-half (1-1/2) inches deep and spaced six (6) inches on center. The type B steel roof decking spans no more than seventy-two (72) inches between joists or beams. The roof decking of the north, south and west wings are constructed with type N, 20-gauge structural steel roof decking. The type N steel roof decking is formed with ribs that are three (3) inches deep and spaced eight (8) inches on center. The type N steel roof decking spans no more than one-hundred and twelve (112) inches between joists or beams. Both types of decking support foam insulation board and a single-ply membrane roofing.

Building C: Public Works, Exterior Storage: The public works exterior storage building is seen in Figures 22, 23 and 24. The roof of this building is framed with glue-laminated roof beams supported on steel framing and masonry bearing walls, as seen in Figure 24.

The main roof of the exterior storage building is framed with glue-laminated lumber beams, oriented east to west (front to back of the building). The glue-laminated lumber roof beams are nominally five (5) inches wide by eighteen (18) inches deep. The glue-laminated roof beams are spaced no greater than thirty-two (32) inches on center or twenty-two (22) inches clear between beams.

The glue-laminated lumber beams are supported on their west ends by the western exterior masonry bearing wall of the building and on their east ends by steel beams. The steel roof beams on the east (open, front) of the building are fourteen (14) inches deep and span twenty-five (25) feet.

The roof of the southern portion of the exterior storage building is framed with nominal 2x10 structural grade dimensional lumber rafters. These 2x10 rafters are spaced sixteen (16) inches on center and span approximately twelve (12) feet, six (6) inches between masonry bearing walls.
The roof framing members described above support three-quarter (3/4)-inch-thick plywood roof decking. The plywood decking supports single-ply membrane roofing on the main roof and standing-seam metal roofing on the southern portion.

Building D: Public Works, Equipment: The public works equipment building is seen in Figures 18, 19, 20 and 21. The roof of this building is framed with wide-flange steel roof beams supported on steel framing and masonry bearing walls, as seen in Figure 19.

The wide-flange steel roof beams range in depth from ten (10) inches to sixteen (16) inches. The spans of the wide-flange steel roof beams range from approximately fifteen (15) feet to thirty-five (35) feet.

The roof beams described above support type N, 20-gauge structural steel roof decking. The type N steel roof decking is formed with ribs that are three (3) inches deep and spaced eight (8) inches on center. The type N steel roof decking spans no more than one-hundred and twenty (120) inches between joists or beams. Both types of decking support foam insulation board and a single-ply membrane roofing.

Understanding of Conditions: I have reviewed the materials which you have sent to me, describing the materials and details of the roof framing systems of the four buildings that were examined on site. I understand that the following conditions apply to the installation of the solar collection system:

1. The solar panels will be mounted on the main roof areas and on the sloping, southern portion of the Exterior Storage building.
2. The panels may be mounted an angle of up to 10 degrees to the plane of the roof.
3. The installer of the solar panels will provide and install fasteners, and all mounting components above the roof structure to comply with all code-required structural loads.
4. The installer of the solar panels will seal all penetrations in the roofing material to ensure a weather-tight installation.

Metal Roofing Area at South of Exterior Storage:

5. The panels will be supported on the southern roof of the Exterior Storage building by rails fastened to the standing-seam roof with S-5 clamps or equivalent.
6. The S-5 clamps will be spaced forty-two (42) inches on center within eight (8) feet of the edge of the array and eighty-four (84) inches on center in the center of the array.
7. Two (2) rails will support each row of panels.

Membrane Roofing Areas:

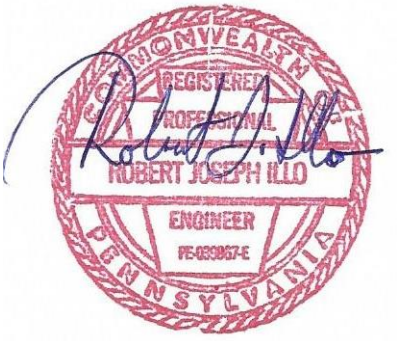
8. The panels will be mounted to the remaining roof areas on a framework that is held to the roof with ballast blocks.
9. The panels, combined with ballast and frame mounting system, will impose approximately eight (8) pounds per square foot onto the portion of the roof directly under the panels.
10. The installer of the solar panels will provide and install fasteners, and all mounting components above the roof structure to comply with all code-required structural loads.
11. The installer of the solar panels will seal all penetrations in the roofing material to ensure a weather-tight installation.

12. If any components on the roof that require service or any part of a pathway to those components are located within ten (10) feet of an edge of the roof, a guard will be required in accordance with Chapter 10 of the International Building Code (IBC). It is understood that the solar panels do not require service, as they produce power throughout their lifetime without routine maintenance or service.

Conclusions: Based on my review of the materials which you have sent to me, and the understanding of conditions listed above in conjunction with my field inspection and analysis of the roof structures, I can conclude, with a reasonable degree of structural engineering certainty, that the roof structure as constructed and in its current condition is capable of supporting the solar collection panels in conformance to all applicable codes as described above without further modifications.

Thank you for allowing me the opportunity to provide you with my services.

Sincerely,
architecture + engineering innovations



Robert J. Illo, AIA, PE
Principal

cc: File

Figure 1

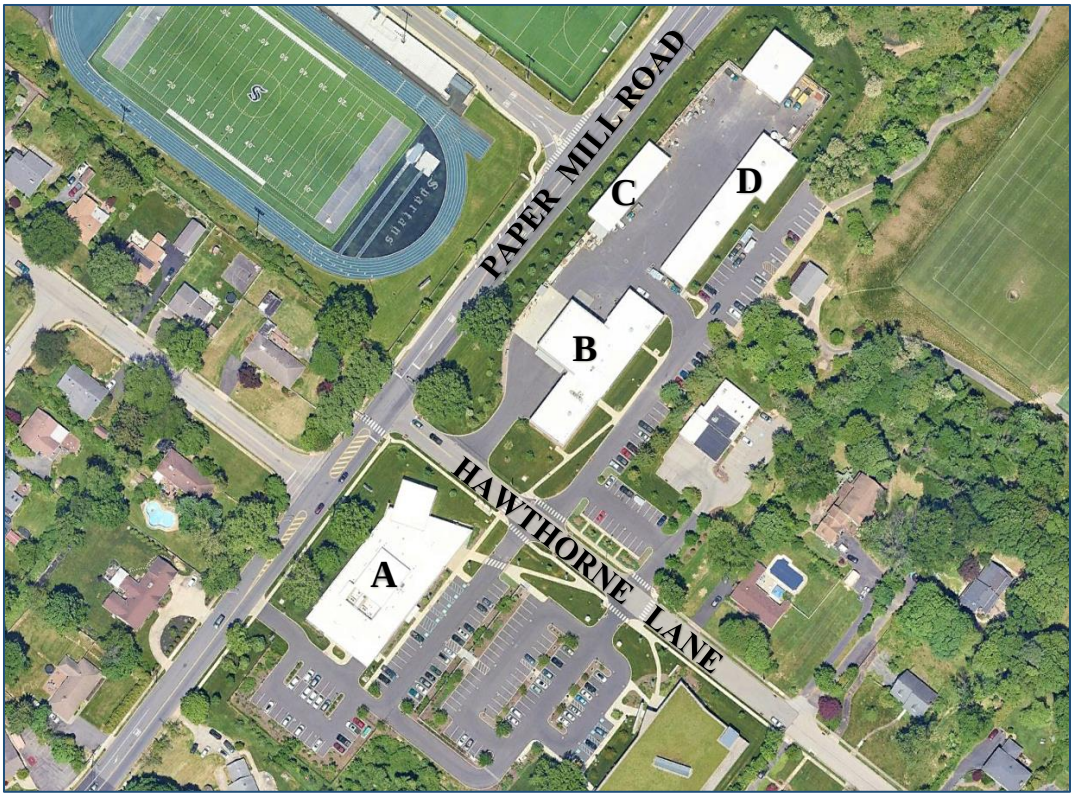


Figure 2

Figure 3

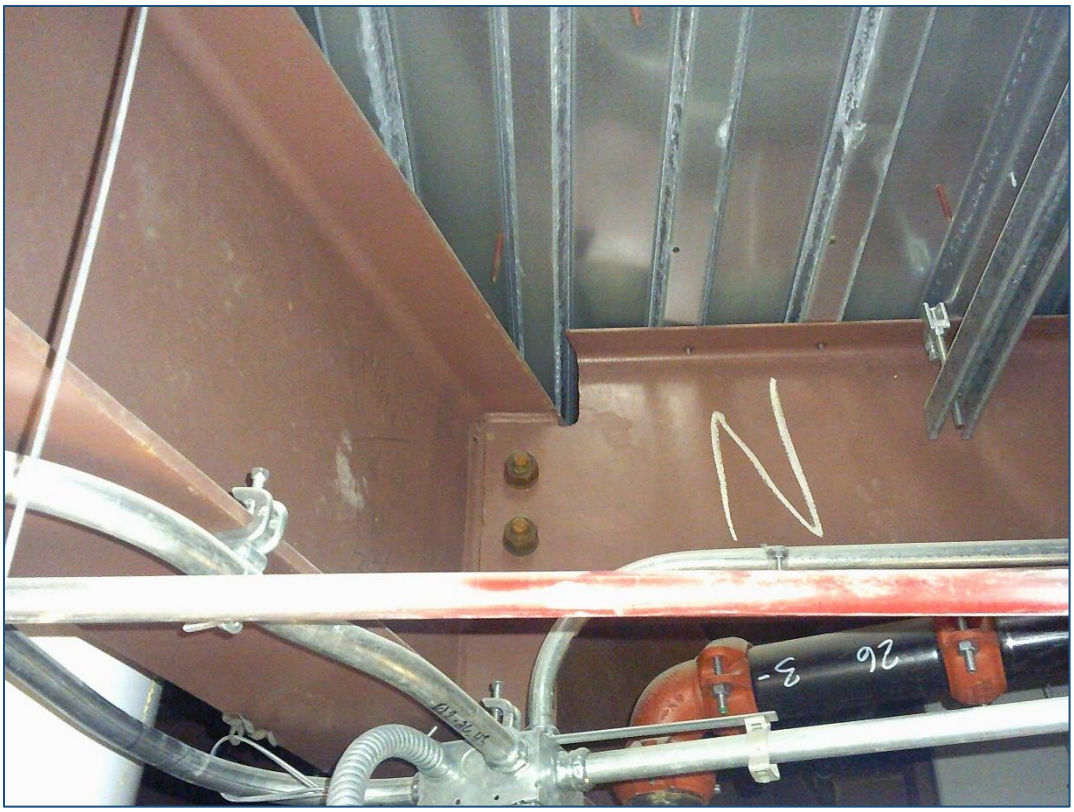


Figure 4

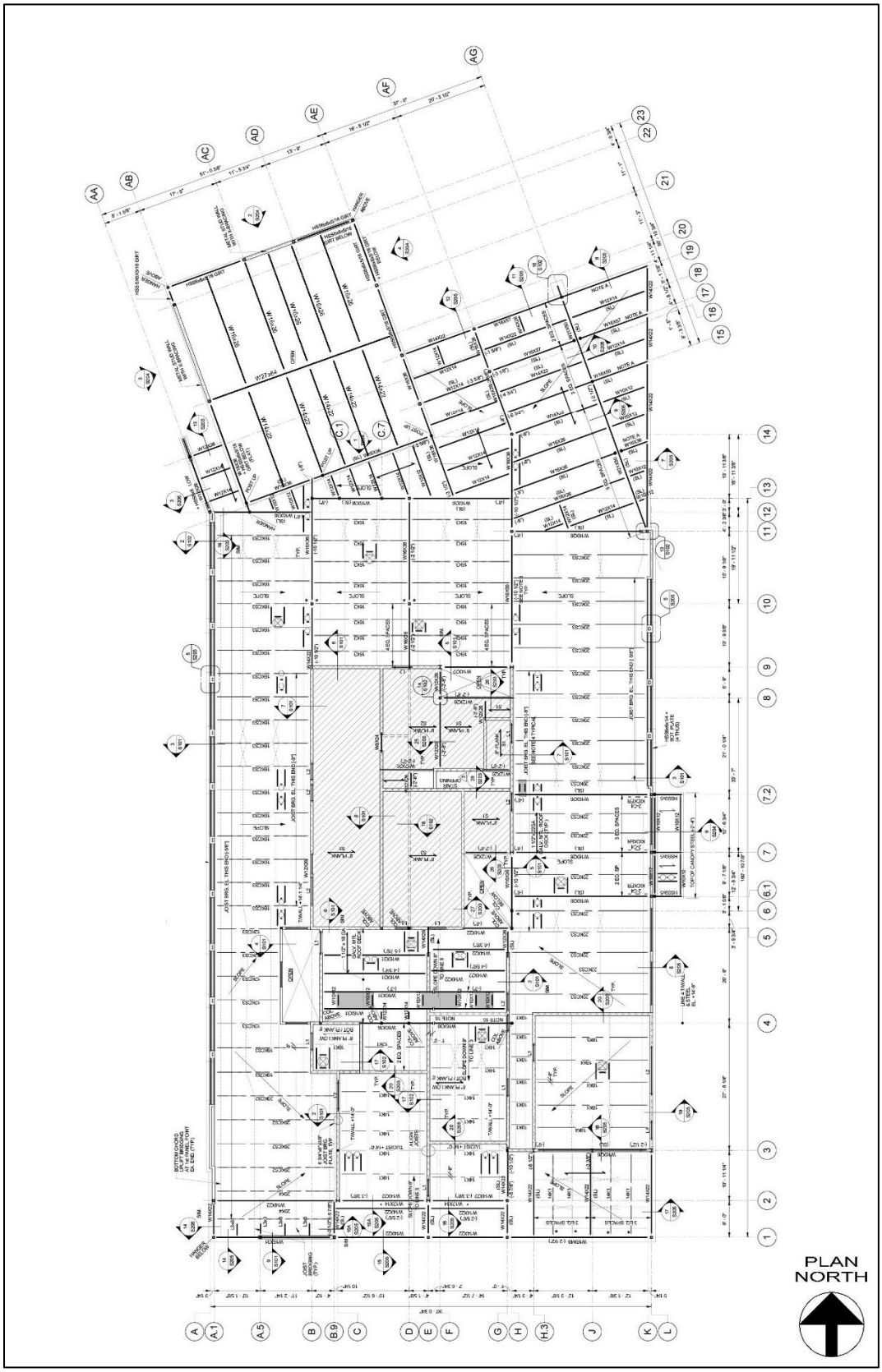


Figure 5

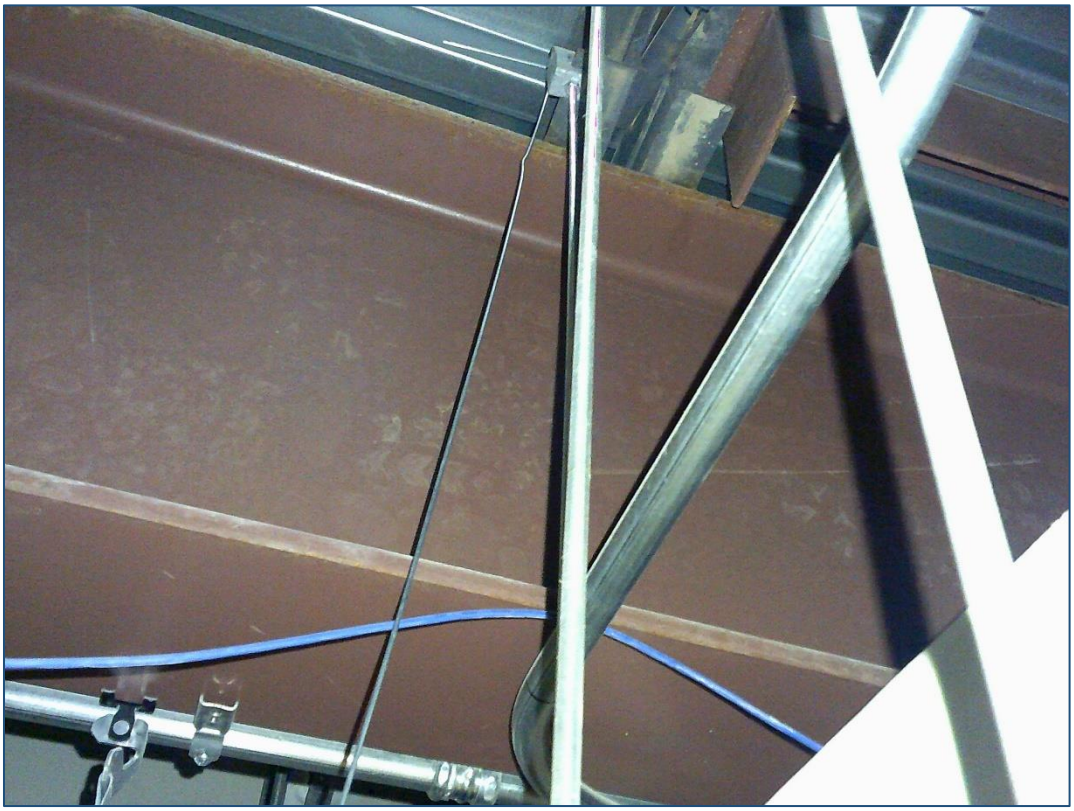


Figure 6

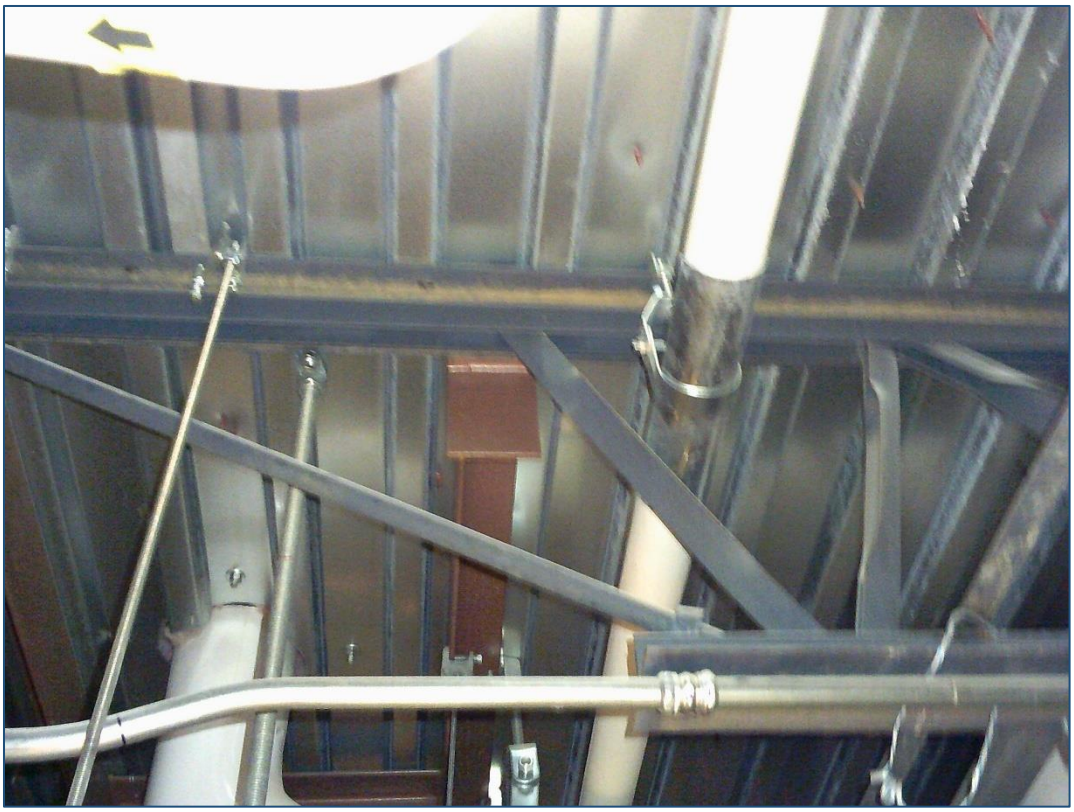


Figure 7

Figure 8

Figure 9

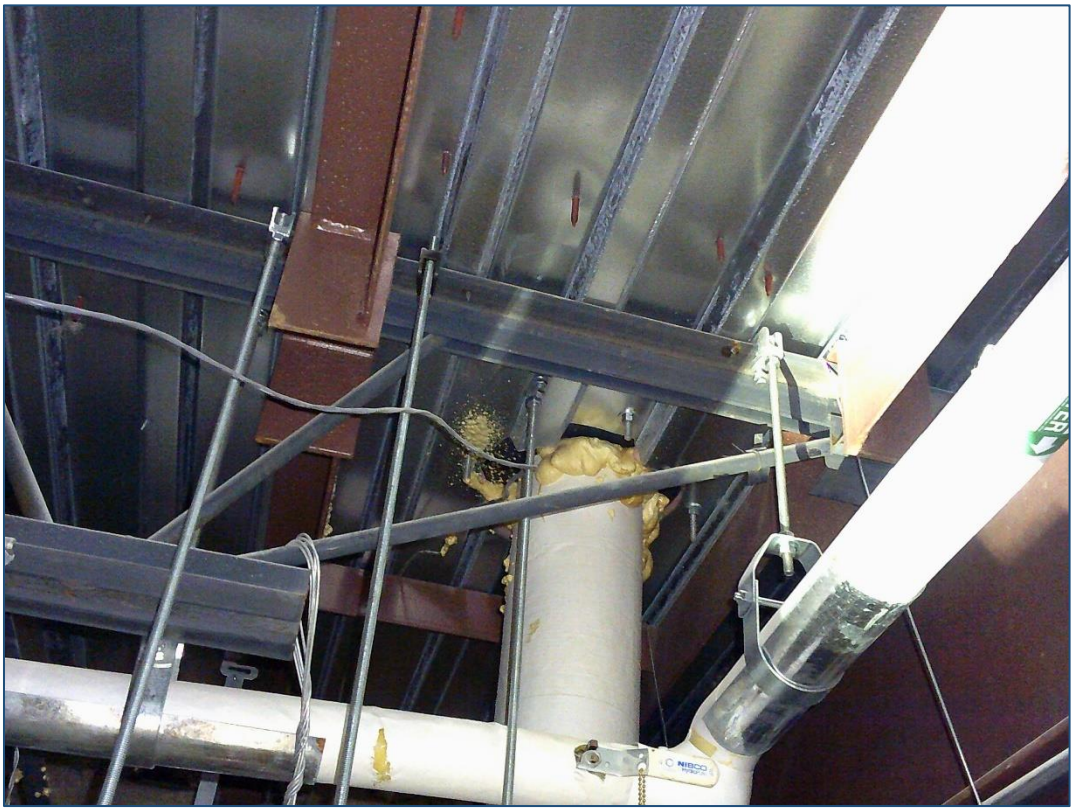


Figure 10

Figure 11

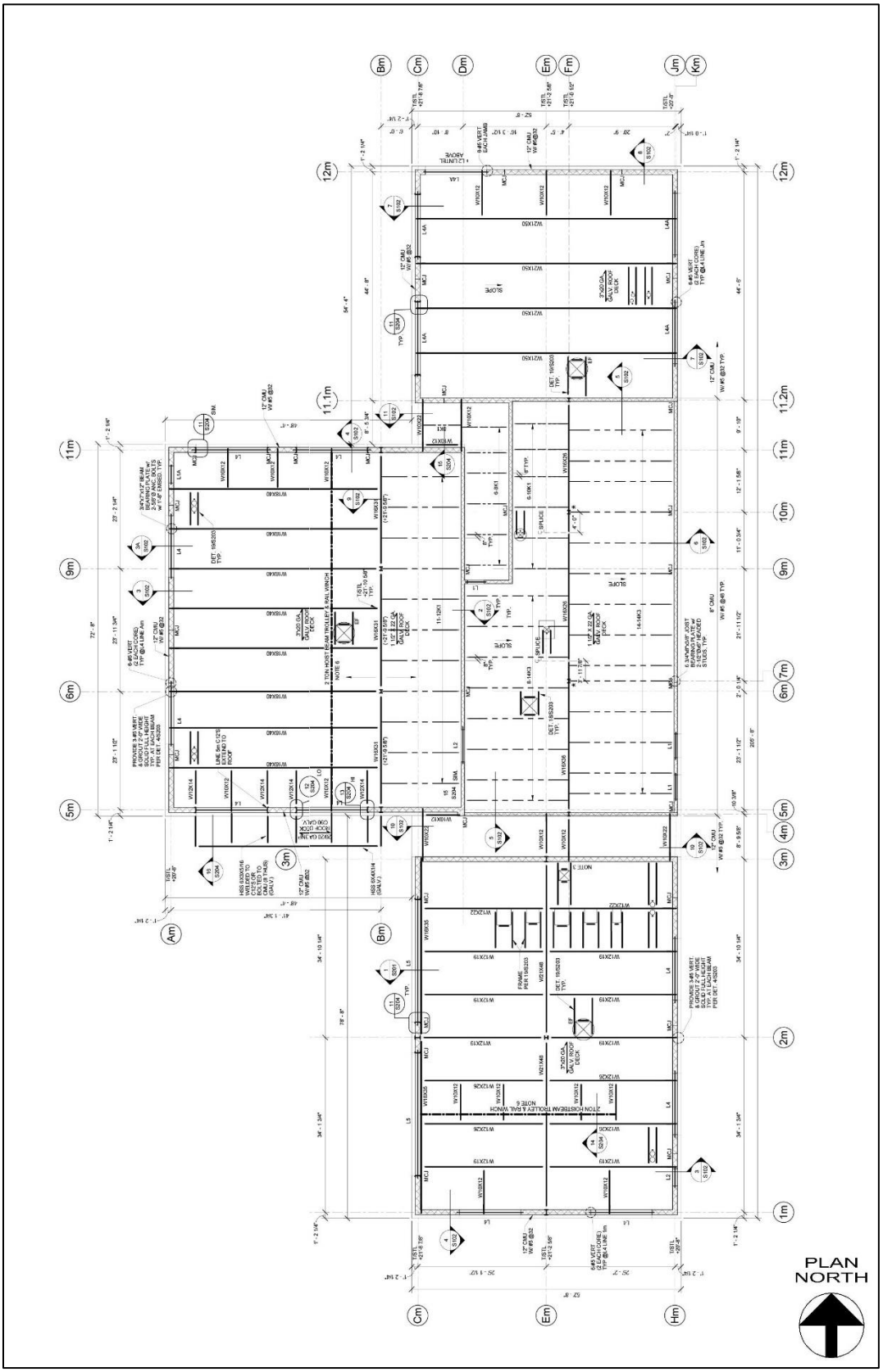


Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

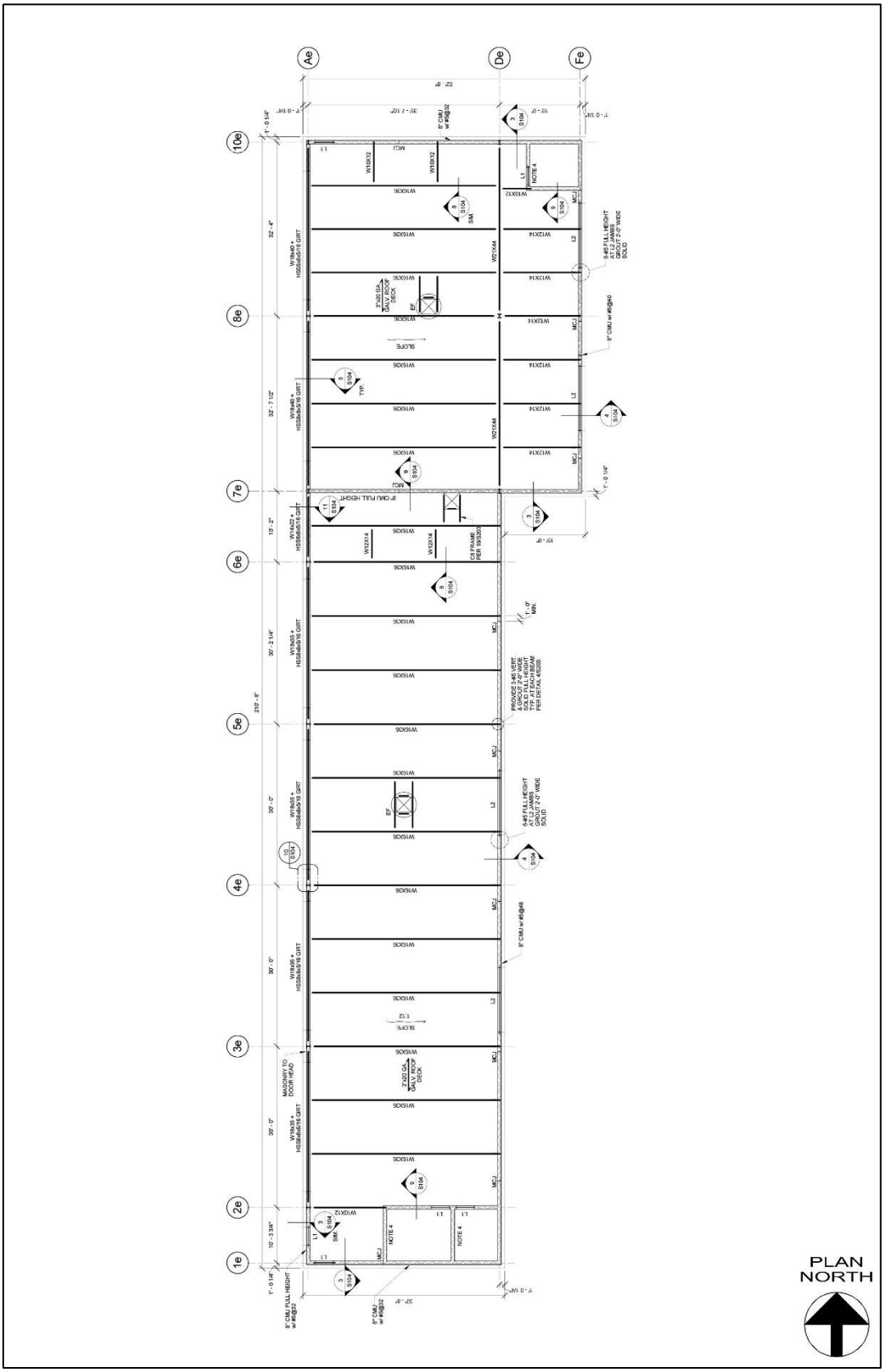


Figure 19

Figure 20

Figure 21

Figure 22

Figure 23

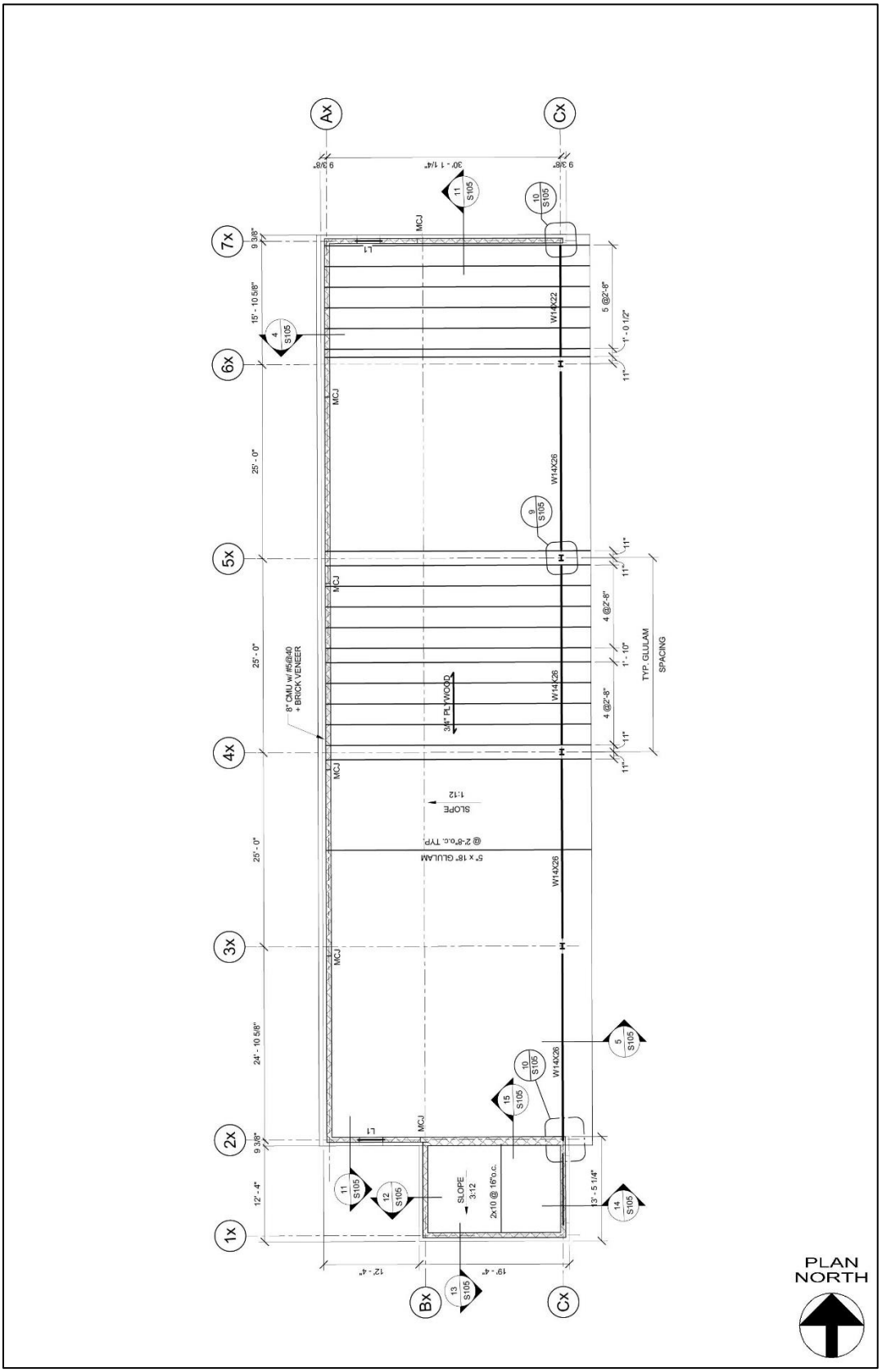

Ax
Cx
7x
6x
5x
4x
3x
2x
1x
Bx
MCJ
W14X22
W14X26
5 @2'-8"
4 @2'-8"
1'-0 1/2"
1'-10"
TYP. GLULAM SPACING
8" CMU w/ REBAR + BRICK VENEER
3/4" PLYWOOD
SLOPE 1:12
5" x 18" GLULAM @ 2'-8" o.c. TYP.
SLOPE 3:12
2x10 @ 16" o.c.
25'-0"
24'-10 5/8"
15'-10 5/8"
12'-4"
13'-5 1/4"
30'-1 1/4"
12'-4"
19'-4"
PLAN NORTH

Figure 24