



NAVAJO FOREST **PRODUCTS BUILDING** **ASSESSMENT**

VISUAL STRUCTURAL EVALUATION

JULY 2018

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EXECUTIVE SUMMARY



NAVAJO FOREST PRODUCTS
INDUSTRIAL BUILDING
JULY 19, 2018

Dekker/Perich/Sabatini (DPS) was engaged to perform a visual structural engineering assessment of a single industrial building located in Navajo, New Mexico. The building was part of the Navajo Forest Products Industrial (NFPI) complex, and has been decommissioned since the mid 1990's.

The structure supporting the roof was exposed and was visible at the far north end of the facility; however, due to asbestos lining the walls and roof, as well as the overall condition of the facility, direct observation/measurement of the structural framing was not permitted. At other locations, supplemental framing that was used to process wood products was obstructing any direct observation of the roof beams or deck. See photos 31 through 35.

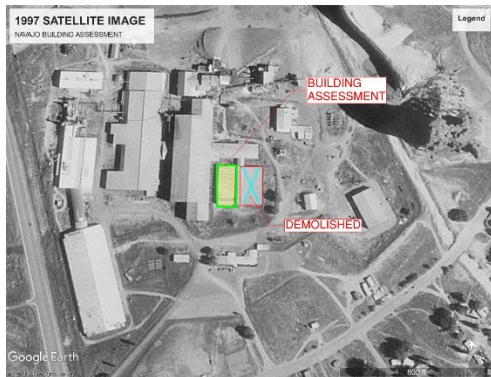
The exterior concrete walls around the perimeter had minor to moderate cracking and spalling. The interior concrete walls, labeled 2 through 10, could not fully be observed due to asbestos contamination and safety concerns; reference appendix A for wall labels. At the northeast side of the facility, the structure had some major damage to concrete walls labeled 1, 2 and 12. The damage revealed that all three walls contain reinforcement, see photo 4. Overall, the observed concrete walls appeared to be in fair to poor condition, except for the damaged area on the northeast side which was in bad condition. Respectively, no distress was observed and any damaged, under reinforced areas, concrete cracking or spalling could be repaired and strengthened as necessary.

The roof and catwalk beams appeared to have some corrosion; however, without directly measuring the beams, it was not possible to determine the amount deterioration. See photo 29. Furthermore, without additional structural analysis and testing it is unknown whether the catwalk beams provide intermediate support for the concrete walls. The connections from the beams to the concrete walls appear to be distressed, possibly due to thermal movement and exposure to moisture. Once the facility has been decontaminated, a more thorough observation can be completed to determine if the connections and

beams are adequate or need to be reinforced. Also, once the member sizes and connections are determined, a more detailed analysis could be done to determine if the catwalk steel framing provides intermediate support to the concrete walls.

Lastly, the roof deck is in poor condition and does not act as an engineered roof diaphragm. It is recommended the roof diaphragm be removed and replaced with a properly designed diaphragm.

INTRODUCTION



1997 SATELLITE IMAGE



2005 SATELLITE IMAGE
PORTION OF BUILDING
REMOVED

Dekker/Perich/Sabatini was retained to provide a qualitative structural assessment of the building located in Navajo, NM. The building was part of the Navajo Forest Products Industrial (NFPI) complex. The building appears to have been built around the mid to later 1900's and was abandoned in the early 1990's. The 1997 satellite image shows there was a building directly adjacent to the one we are assessing; while, in 2005, it appears the adjacent building was demolished. See images to the left. The existing concrete building is approximately 180 feet long (north to south) and 108 feet wide (east to west). There are 11 concrete walls in the east-west direction, and 2 walls in the north-south direction. For reference, see key map in Appendix A for wall labels.

A qualitative structural assessment is an experience-based visual assessment of deterioration effects, distress or other damage to the structure and is intended for use as a pre-evaluation of the structure. During observation, visual deterioration effects like corrosion of steel members, distress, or visual signs of damage (cracks, spalling) are noted.

Our scope did not include developing structural drawings to repair, strengthen, shore or modify the structure; nor, did it include any model based assessments to calculate capacities/demand/code requirements.

Scope of Work

Qualitative structural assessment

- Determine, through a visual observation, the condition of the supporting structure
- Identify potential distressed framing members that can be accessed and viewed from outside the building extents
- Perform on-site visual and photographic observations
- Provide a report to summarize the structural evaluation

SITE VISIT

TYPICAL FOUNDATION @
EXTERIOR WALL 12

TYPICAL ROOF STRUCTURE



TYPICAL OPENING IN WALL 12

TYPICAL CONCRETE DEBRIS
AROUND PERIMETER

D/P/S conducted a site visit on July 19, 2018. We were met by representatives from the Navajo EPA who provided access to the NFPI building and Peter Lawrence, response manager from EQM. The site visit was completed in order to provide views of the general condition of:

- Beams
- Concrete Walls
- Roof Deck
- Foundations

The information below was obtained from visual observations, discussions with Navajo EPA and EQM. Structural drawings of the facility were not available.

Foundations:

The foundations were not visible; however, there was debris adjacent to the facility that suggests the building more than likely is supported by a system of reinforced concrete spread and continuous footings bearing on compacted subgrade. See photo to left labeled "CONCRETE DEBRIS AROUND PERIMETER". Also, during the walk, no trenches or basements were observed. The slab on grade within the facility is of unknown thickness and reinforcement.

Roof Superstructure:

The building could only be observed from outside of the facility due to asbestos contamination and safety concerns. At the northeast side, the roof beams were observed at approximately 4'-0" OC. Between each beam was a skylight. See photo 27, 28 and 29. The beams support a corrugated asbestos roof, with what appeared to be a gypsum or lightweight concrete topping, reinforced with welded wire fabric. See photo 26.

Miscellaneous structure:

Below the roof superstructure, there are steel beams that appear to be a utility support and catwalk structure; see photos 31 thru 35. The catwalk supports have been removed at the front of the bay between wall 1 and 2. Looking at photo 29, it appears that the miscellaneous steel utility



TYPICAL WALL 11 AND 13



DAMAGE TO WALL 1, 2 AND 12



TYPICAL WALL 1, 11 AND 13

TYPICAL COLD JOINT BETWEEN
CONCRETE WALL AND STEM
WALL

and catwalk structure does not support the roof and is independent of the roof superstructure; however, it is unclear if the intermediate beams provide wall support. This will need to be confirmed if this building undergoes modifications.

Concrete Walls

Referencing the key map in Appendix A, there are 11 concrete walls in the east-west direction and 2 exterior concrete walls in the north-south direction. The walls were approximately 22 feet to 24 feet in height.

Since wall 1 was damaged, the thickness and reinforcement was easily observed. Wall 1 is 8 inches thick, with a single mat of reinforcement approximately centered in the wall. The horizontal and vertical reinforcement appears to be either 1/2 inch or 5/8 inch in diameter, with a bamboo rib pattern at roughly 18 inches to 20 inches OC.

Wall 12 is 12 inches thick and reinforcement was observed at the top of the wall on the northeast side. The rebar that was exposed appeared to be reinforcement for a lintel that was removed. The diameter of the bars were between 1/2 inch and 5/8 inch. As far as jamb reinforcement between the openings, it is unknown. The jamb width was approximately 5 feet to 6 feet wide, and the openings were approximately 10 feet wide by 14 feet tall. Another characteristic of wall 12 is the embed channels on the lower portion of the lintel, and angle embeds on the sides of the jambs. They appear to have been installed to prevent damage to the jamb and lintel. The wall had concrete chutes over the openings; however, only two exist today at the southeast side; see photo 5.

For walls 2 thru 11, as well as 13, no exposed rebar was observed and the thickness of the wall could not be determined. Pending additional studies, the walls are assumed to be as thick as the adjacent walls, and are more than likely reinforced, similar to other walls. This will need to be confirmed.

All walls were observed to have a moderate amount of cracking and spalling, which appeared to be from initial shrinkage, thermal movement



TREE ADJACENT TO FOUNDATION

and moisture issues. Also, the walls had approximately 4 inch wide continuous vertical plates bolted to the surface at approximately 10 feet to 12 feet on center. It is thought these plates cover the construction joints between concrete panels. See photo 8. Furthermore, the condition of the reinforcement connecting the foundation stem wall to the concrete wall is unknown.

Our field observations have determined the following:

1. No foundation settling was observed; however, there was quite a bit of concrete spalling, cracking and deterioration at wall 12 stem walls. It is recommended to remove all vegetation from the perimeter of the building to prevent future damage or heaving of the foundation. Trees were also observed directly adjacent to the facility (see photo to left); it is recommended to have those carefully removed to avoid any potential heaving/damage/etc. to the foundations. If undermining is a possibility during removal, underpinning might be required. If the building is repurposed, additional studies may be required to determine foundation type/capacity.
2. The beams supporting the corrugated asbestos roof appeared to have some corrosion. To what extent is unknown, since the beams could not be measured or closely observed. If the beams are to be reused or repurposed, we recommend further studies after decontamination to ensure they are adequate.
3. The corrugated asbestos roof, with what appeared to be a gypsum or lightweight concrete topping reinforced with welded wire fabric, appeared to be in poor condition and not positively attached to the beams or walls. The underside of the deck exhibited a varied amount of deterioration and distress, with signs of damage to both the deck, topping and wire mesh. Not only is the structural roof deck in very poor condition, it does not act as an engineered diaphragm. A lateral diaphragm is an essential element in providing support for structural elements subject to wind or seismic elements and distributing those

loads to the lateral force resisting elements, which for this building are the concrete walls. A diaphragm is typically created by floor or roof decks, floor slabs or engineered bracing. In the case of this particular NFPI building, it has relied on asbestos corrugated roof deck below a welded wire fabric (WWF) reinforced gypsum roof deck system as its lateral diaphragm. This system was apparently not engineered as, nor was it intended to be constructed as, a suitable diaphragm. It is recommended the diaphragm be removed and replaced with a properly designed diaphragm.

4. Only a few beam to wall connections were observed due to limited access of the building. For the connections that were visible, they appeared to have a varied level of distress, and is probably due to thermal movement and/or corrosion. The capacity of the connections are unknown until further investigation can be completed after decontamination.
5. Overall, the concrete walls are in fair to poor condition. No distress or lateral movement was observed; however, a moderate amount of spalling and cracking is present. Wall cracks were observed to be roughly 1/16 inches to 1/8 inches wide; some localized areas were wider. Based upon the rebar spacing measurements taken in the field, it appears wall 12 does not meet ACI crack control criteria. Given this information, and the observed cracking, it appears that many of the walls may not have adequate crack control reinforcement. The issue with some of the cracks, is the potential for moisture to infiltrate and corrode rebar; therefore, reducing the capacity of the wall. If the walls are repurposed, testing may be required to determine if the rebar has experienced an excessive amount of corrosion. Also, without doing a detailed model based structural analysis, it is unknown whether the walls are braced by only the roof beams or the roof beams and the catwalk structure. In conclusion, future structural studies should ensure the concrete walls meets code requirements.

CONCLUSION

Overall Condition Observations

In general, the overall structure is in fair to poor condition. The corrugated asbestos roof and light weight concrete topping is in poor condition, and should be removed and replaced by a properly designed roof structure. It is likely the concrete walls can be repurposed; however, further structural studies, field testing and analysis will be required. As far as the beams and connections, if they are to be salvaged, these too will need further structural studies and analysis to not only ensure they are adequate for the required spans and reactions, but also to make sure the beams/connections have not experienced too much deterioration or are under capacity.

Speaking with Peter from EQM, he stated there is a possibility the building will be decontaminated and potentially repurposed. If so, he noted the corrugated asbestos roof and light weight concrete topping would be removed, and more than likely the beams supporting the roof/catwalk removed as well. If this work is pursued, the walls would need to be properly shored; promptly after decontamination, new structure/diaphragm would need to be installed and properly fastened. Also, any existing structure that is set to remain, shall be verified for code requirements prior to commencement of any work. It is recommended that a structural engineer (and quite possibly an architect/MEP engineer/civil engineer) is engaged to provide a safe and adequate design that meets the facility shoring/repurposing requirements.

Dekker/Perich/Sabatini offers no warranty regarding the condition of hidden construction or subsurface conditions beyond what was revealed in our review. Any comments regarding hidden construction or subsurface conditions are our professional opinion, based on engineering experience and judgment, and derived in accordance with current standard of care and professional practice.

The comments in this report are not intended to be comprehensive but are representative of observed conditions. We have made every effort

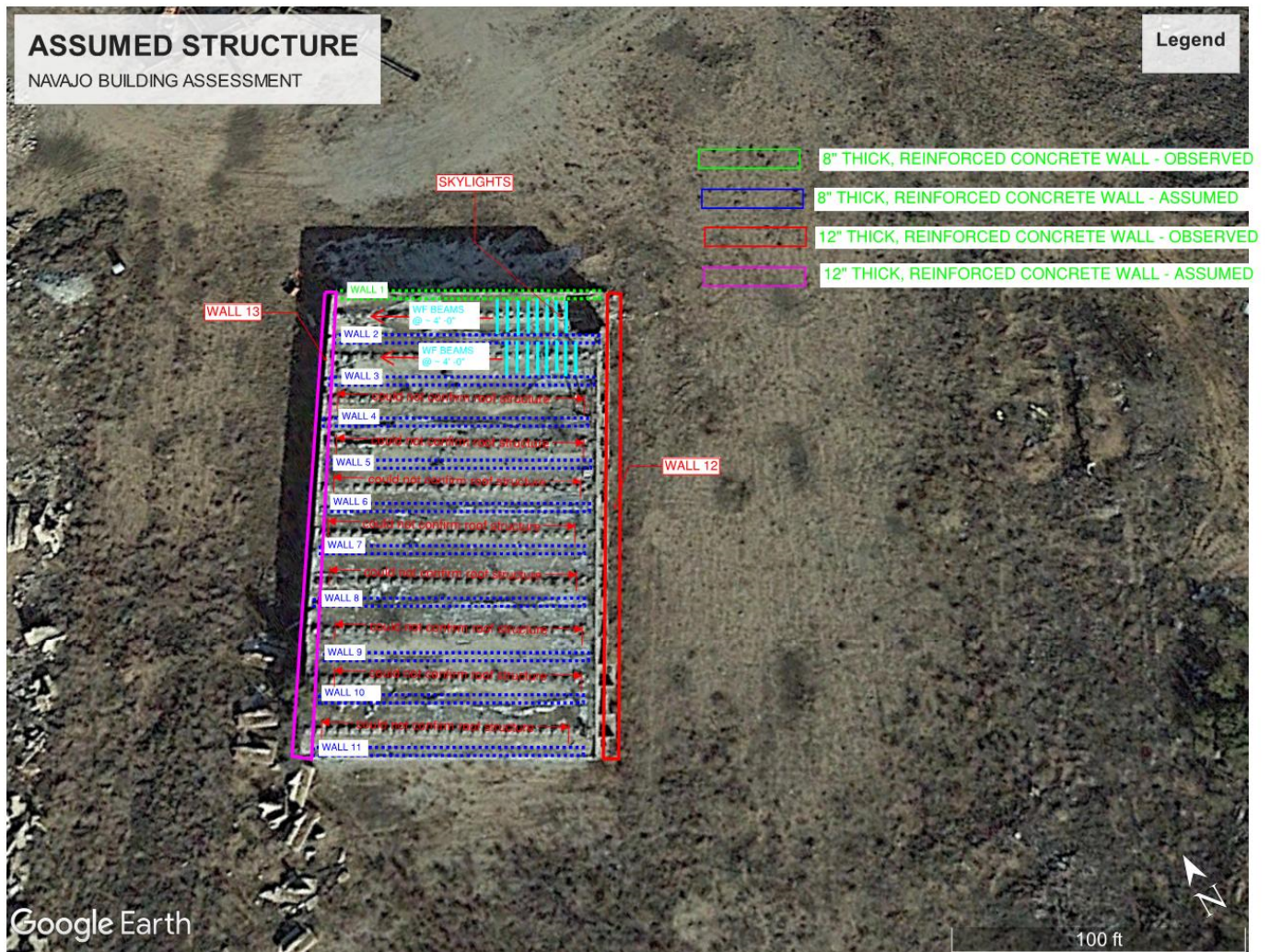
to reasonably present the various areas of concern identified during our site visits. If there are perceived omissions or misstatements in this report regarding the observations made, we ask that they be brought to our attention as soon as possible so that we have the opportunity to fully address them in a timely manner.

Appendices

Appendix A - Assessment Key Map

Appendix B - Additional Photographs

Appendix A –Key Map



Appendix B – Additional Photographs



Photo 1 (SOUTHWEST CORNER)



Photo 2 (SOUTHEAST WALL)



Photo 3 (NORTHWEST WALL)



Photo 4 (NORTHEAST CORNER)



Photo 5 (CONCRETE CHUTES)



Photo 6 (REMOVED CHUTE)



Photo 7 (TYPICAL OPENING)



Photo 8 (TYPICAL STEEL PLATE @ JTS)



Photo 9 (CHANNEL OVER LINTEL)



Photo 10 (LINTEL CLOSE UP)



Photo 11 (TYPICAL JAMB - WALL 12)



Photo 12 (EXTERIOR WEST WALL)



Photo 13 (TYPICAL BOLTED PLATE)



Photo 14 (WEST WALL)



Photo 15 (TYPICAL BOLTED PLATE)

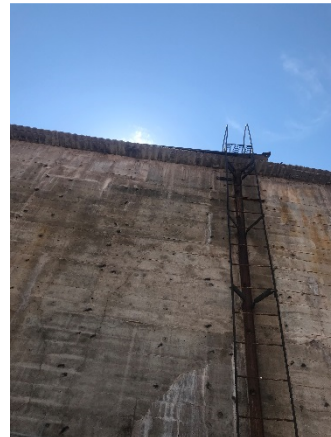


Photo 16 (LADDER ON WEST SIDE)



Photo 17 (TREES ADJACENT TO BUILDING)



Photo 18 (TREES ADJACENT TO BUILDING)



Photo 19 (HORIZ. REINF. SPACING WALL 1)



Photo 20 (VERTICAL BAR SIZE – WALL 1)



Photo 21 (LINTEL REINF. WALL 1)



Photo 22 (HORIZONTAL BAR SIZE – WALL 10)



Photo 23 (WALL 1 THICKNESS)



Photo 24 (STEMWALL THICKNESS WALL 12)



Photo 25 (WALL THICKNESS WALL 12)



Photo 26 (ROOF DECK)



Photo 27 (NORTHEAST SIDE OF BUILDING)



Photo 28 (NORTHEAST SIDE OF BUILDING)



Photo 29 (BAY BETWEEN WALLS 1 AND 2)



Photo 30 (BAY BETWEEN WALL 1 AND 2)



Photo 31 (TYP. UTILITY/CW SUPPORT)



Photo 32 (TYP. UTILITY/CW SUPPORT)



Photo 33 (TYP. UTILITY/CW SUPPORT)



Photo 34 (TYP. UTILITY/CWSUPPORT)



Photo 35 (TYP. UTILITY/CW SUPPORT)



Photo 36 (TYPICAL WALL CRACK)