Structural Evaluation of the Teton County Solid Waste Transfer Station

June 2013 Final Report

Submitted by:

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SECTION

1 INTRODUCTION

Golder Associates Inc. engaged Merrick & Company to visit the site and prepare a report on the Teton County Solid Waste Transfer Station. The intent of this project was to perform a building observation, document our findings of the structural condition of the existing transfer building, and provide recommendations for future upgrades. The site is located south of Jackson, Wyoming, in a rural area adjacent to U.S. 86.

The building was originally designed by Nelson Engineering in 1988. The structure was built on a sloping grade with a retaining wall running north south under the building, along the transfer tunnel, supporting the foundation backfill at that location. Damage to the building foundation was observed at this exposed location, which may be due to differential settlement. Based on the findings of this report, future decisions on the expansion of this facility will be made.

This report is limited only to the elements listed in the Scope of Work and should not be construed as a guarantee that all original building construction was in accordance with the plans. Only visual observations of the structural systems were made, and no other systems were evaluated by Merrick. No detailed inspections or testing of any kind has been performed as part of this assessment.

1.1 Scope of Work

The Scope of Work includes the following work items:

1) Perform structural observation, documenting structural irregularities.
2) Determine the feasibility of increasing the existing tunnel opening.
3) Determine if the existing office can be removed without impacting the existing structure.
4) Determine if a new push wall can be constructed inside the facility.
5) Determine whether the existing north retaining walls / abutments (inbound and outbound) are capable of sustaining potential interim loads due to localized improvements.
6) Determine the feasibility of expansion of the existing facility with additional bays.

2 BUILDING EVALUATION CRITERIA

2.1 Data Collection

For the purpose of conducting the building observation of the Transfer Building, data collection was based on following three sources of information:

1) Existing architectural and structural drawings provided by the Teton County. These were provided to Merrick as PDF's of the original design drawings.
2) Visual observations made during a site visit and walk-through of the building on April 19, 2013. Photos were taken during this visit for further evaluation and are included in this report where applicable.
3) An interview with Kent Jasperson during the site visit, regarding existing building systems and components that were unclear from either the drawings or the visual observations.

3 EXISTING CONDITIONS

3.1 General

The Teton County Solid Waste Transfer Station is a one-story industrial type building constructed in 1988. The building is a pre-engineered metal building that is founded on concrete spread footings. On the west side of the building, a transfer tunnel runs underneath the building for truck loading. The building is fenced off with controlled public access. The main vehicle entrance into the building is located on the east side of the building. The building has an interior small wood-framed office space located on the south side of the building.

3.2 Geotechnical

The Transfer Building is sited on sloping topography and sits on top of fill material and what appears to be an old landfill area. Boring logs shown on the existing drawings indicate the fill material generally consist of sandy clays and silts with occasional gravel and areas of compacted trash located below the building site. Per the boring logs, no groundwater was encountered up to a depth of 25 ft below grade.

3.3 Structural System

The existing pre-engineered metal building is constructed primarily of steel framing with light gage Z purlins at the roof. The main steel frames of the building are spaced at 11.25 ft on center and are supported on concrete pilasters and concrete spread footings. The exterior of the building is clad in metal siding panels that are typical for this type of construction.

Typical existing building foundations consist of both spread footings and continuous concrete footings. The building has a retaining wall that runs in the north-south direction and forms one side of a transfer tunnel which runs under the west side of the building. The tipping floor slab of the building primarily consists of a concrete slab on grade constructed of a 1-½ inch impact resistant topping slab over a 7 inch thick concrete slab on grade with the slab under the office area consisting of a 6 inch slab on grade. The slab over the transfer tunnel is a reinforced 10-inch thick structural slab that is supported by steel beams and concrete walls below.

4 FINDINGS AND RECOMMENDATIONS

4.1 Foundation

Based on initial observations, the existing structure shows signs of differential movement of the foundations system. The major indication of this is the appearance of cracking in the foundation wall system on the north and south side of the building. In two locations, the cracking is quite severe; see Figures 1 through 4 for pictures and locations of these cracks. These cracks appear to be located at the transition between the deep and shallow foundation walls. It also appears that sometime in the past, the crack on the south side of the building was patched, and that patch has subsequently cracked again, indicating foundation movement is still present.

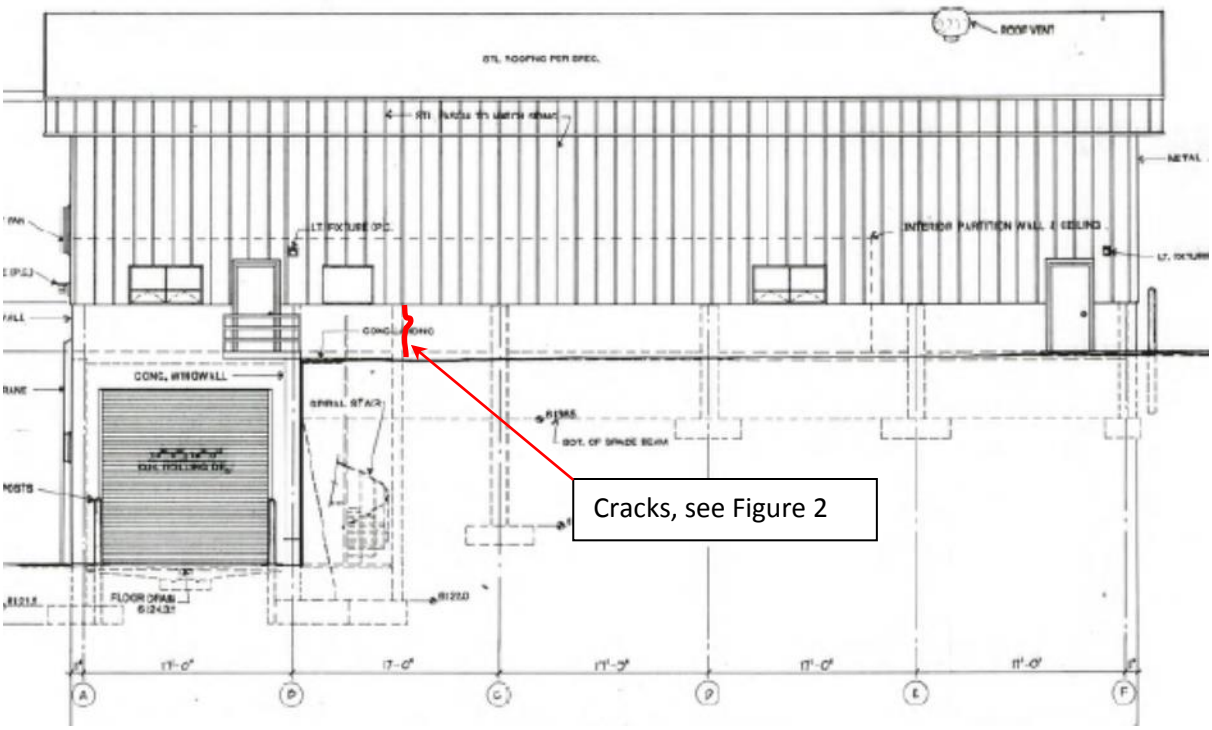
ROOF VENT
INTERIOR PARTITION WALL & CEILING
CONC. WINDWALL
Cracks, see Figure 2

Figure 1

Figure 2

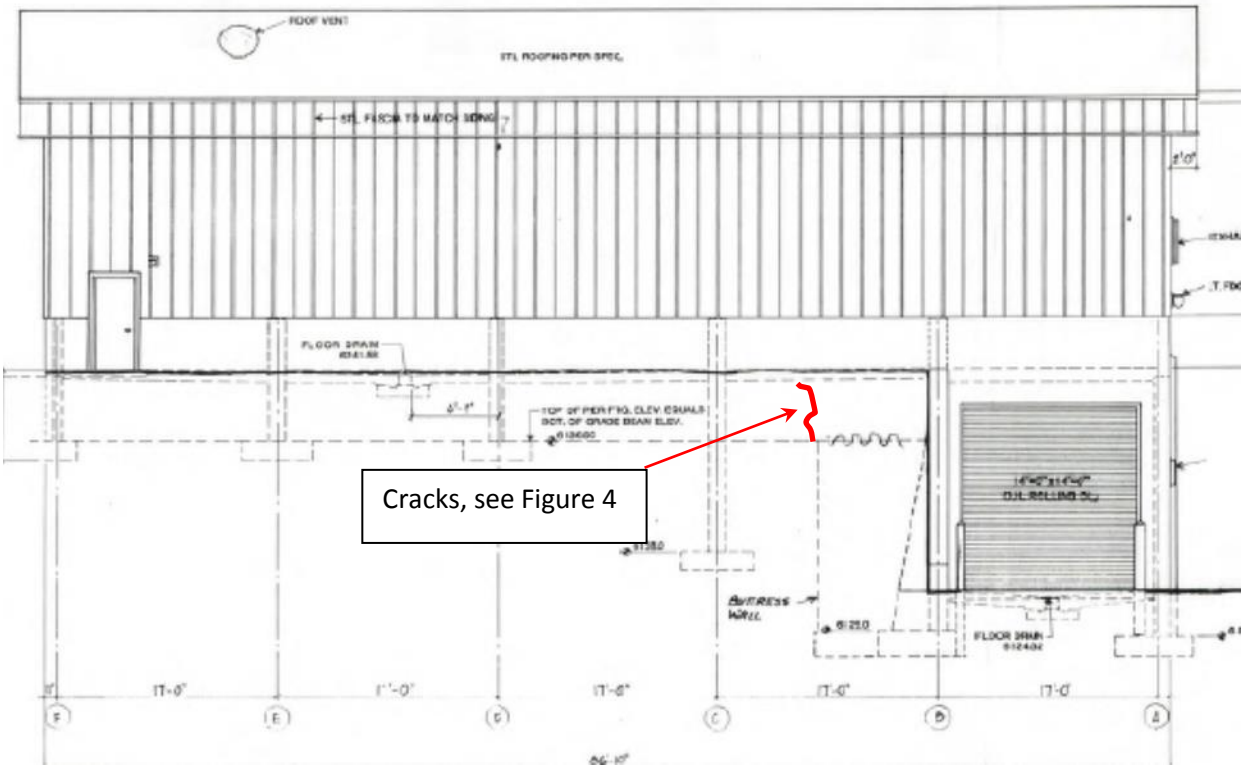

Figure 3

Figure 4

In addition to these cracks, there were other locations that showed signs of foundation movement. There were cracks at the corners of the tunnel openings and shear cracking in the retaining walls due to differential settlement of the foundation.

To understand why this cracking is occurring, we need to determine what was causing the foundation movement. In Merrick's conversations with Kent Jasperson of Teton County, it was determined that at one time there was a broken water pipe under the building that was feeding water into the surrounding soils. Additionally, it was discovered during the site visit that the building currently does not have any gutters or downspouts which typically are used to channel rainwater and snowmelt away from the building foundation. Without these elements, all of the water from the roof has been funneled into the soils around the foundation. See Figure 5 which shows indentations in the surrounding grade of the building where this runoff has been falling. It was also brought to Merrick's attention that during an earthquake, the crack on the north side of the building became worse which would indicate that the surrounding fill are susceptible to movement during a seismic event. This is evident by the surface rupture which occurred during the earthquake and lies within 100 ft of the building; see Figure 6.

Figure 5

Figure 6

Based on this information, it becomes evident the addition of the water to the surrounding soils has caused the soil and possible trash under the foundation to consolidate and settle. There is also evidence to suggest the fill soils are susceptible to movement from seismic activity. Both these factors are what caused the foundation movements, wall fractures and wall cracking.

At this time, it is Merrick's opinion the building is stable and safe for operations. However, if movement continues or another seismic event occurs at or near the site causing additional foundation movement, the building may become unsafe for occupancy.

Merrick recommends the severe cracking on the north and south side of the building be repaired and monitored for further foundation movement. It is also our recommendation that gutters and downspouts be properly installed and flashed at the existing facility eaves to channel water away from the building perimeter.

4.2 Pre-Engineered Building

As indicated above, there has been differential settlement of the building foundation which caused cracking of the foundation wall. However, we have determined the pre-engineered metal building is in good condition despite this movement. The lack of distress in the building superstructure can be contributed to the inherent flexibility of the pre-engineered steel framing system.

4.3 Tunnel Opening

As part of the scope, we were asked to determine the feasibility of increasing the existing tunnel opening from 14 ft to 16 ft tall. Based on our site observations and review of the existing drawings, Merrick believes this is possible. By increasing the opening size, however, reinforcing at the top of the wall will be cut. By cutting this reinforcing, its function is rendered ineffective; and additional reinforcing around the opening will be required. Additionally, repair of the corner cracks due to foundation movement will be required.

4.4 Removal of Existing Office and Push Wall

Based on our site observations and review of the existing drawings, removal of the wood framed office area will not have an impact on the structural capacity of the existing facility. The removal of the existing push wall and construction of a new push wall is also feasible. However, the floor slab where the existing office area is located is not of the same heavy duty floor construction as the tipping floor. If a new push wall is located in the area of the existing office, it is recommended that the existing slab be removed and replaced with a concrete floor system similar to the tipping floor area.

If a new push wall is not required, and the area where the current office is located is better served as a trash container area, it has been determined that the existing 6 inch slab on grade would be capable of supporting 3 cy to 20 cy containers.

4.5 Future Building Expansion

Based on our site observations, building code review, and review of the existing drawings, expansion of the existing building does not look to be a cost effective option. Adding to the existing facility would increase the snow load on the facility and would require strengthening of the existing building for these new loads. In addition, the existing building would need to be upgraded to meet the requirements of the current adopted International Building Code.

One option Merrick was tasked to review was whether a new two phase facility could be built on the existing site. The first phase of this facility would be built near the existing facility. Once it is up and running, the second phase would be to demolish the existing facility, and add additional bays to the first

phase. To accomplish this phasing, the first phase of the new facility would need to be located a minimum of 20 ft from the existing building, so as not impact the snow load on the existing building.

One concern of building this new facility is the impact on the existing facility, particularly the impact on the existing retaining walls holding back the soil at the transfer tunnel. It is Merrick's opinion that due to the existing foundation and soil movement, height of the retaining walls, and the bearing elevation required for a new facility, structural mitigation would be required. This would most likely take the form of providing new retaining wall structures.

5 CONCLUSION

Based on site observations, Merrick provides the following opinions:

1) The existing facility is safe for continued use as long as measures are taken to limit the amount of surface water penetrating into the surrounding foundation area.
2) Foundation movement should be monitored, and the building periodically inspected for damage due to foundation movement and settlement. If continued foundation movement and/or a seismic event were to occur in the future the building could become unstable.
3) Merrick believes that expansion of the tunnel opening, removal of the interior office, and installation on a new push wall is possible and would not adversely affect the existing building structure. However, strengthening of the of the tunnel opening and proper design and detailing of a new push wall will be required.
4) Lastly, Merrick believes that future expansion of the facility is possible at the existing site. Proper siting, phasing, and foundations will be required for this new facility to insure this new construction does not negatively impact the existing facility before it is demolished.