

PROJECT SCOPE

This project consists of the inspection and condition assessment of the water tower located on the Atlantic Richfield Co. (AR) Harbor-at-Hastings Site (site), located in the Village of Hastings-on-Hudson, NY. The existing water tower must either be dismantled or demolished to accommodate construction activities for the Superfund remediation of the former Anaconda Wire and Cable Co., including excavation of PCB- and metal-contaminated soils to depths of 9 to 12 feet below grade and restoration of a sloped shoreline.

The existing water tower may be restored or replaced with a replica following the completion of the soil remediation and site redevelopment activities. The water tower is not used as a functioning water tower, but the Village of Hastings-on-Hudson (Village) is exploring its preservation as an aesthetic element of the view shed of the Hudson River and Palisades Cliffs, and as an emblem of the Village. The Village's primary study question, addressed through this assessment, is whether the existing water tower structure can withstand being dismantled, restored, and re-erected.

The following tasks were conducted for this project by Louis Berger U.S. (Louis Berger):

- Attended an on-site coordination meeting with AR on 13 September 2016 to review Louis Berger's proposed assessment activities and AR's safety orientation and procedures for site activities.
- Prepared a site- and activity-specific Health and Safety Plan for the structural evaluation task and incorporate AR's comments on the plan.
- Conducted the water tower structural evaluation field work on 11 November 2016.
- Prepare this evaluation report indicating the condition and findings of the water tower and recommendations.

WATER TOWER DESCRIPTION

The water tower was constructed circa 1916 for the National Conduit & Cable Company, which later became the Anaconda Wire and Cable Company (Photo No. 1). As per the as-built plans the structure consists of four (4) riveted steel, laced posts/columns, each made up of two 12-inch channels with a 14-inch cover plate on the inside face of the post, and cross bars (lacing) on the outside face. The posts extend up approximately 90 high and are each constructed from three sections with splices and lateral support struts spaced at approximately 30-foot intervals. Lateral tower stiffness is provided at each bay of the three post sections with 1 1/8-inch square steel cross rods.

The 75,000 gallon capacity tank, supported by the four posts, is made up of 5 steel welded cylindrical plates with a diameter of 22 feet and a conical shaped steel roof. The bottom two plates and top two plates of the tank have a thickness of 1/4-inch and the middle plate has a thickness of 5/16-inch. The water tower is anchored to a concrete foundation with one 2.5-inch diameter by 6-foot long anchor bolt at each post anchor. The as-built plans indicate that the tower received a shop coat paint of standard Black Graphite and 3 field coats of standard Green Graphite. The current total weight of the water tower is estimated at approximately 50,000 pounds.

INSPECTION PROCEDURE

The inspection was performed by a three-person team (two structural engineers and a Health and Safety Officer), plus the operator for the personnel lift, on the morning of 11 November 2016. The team leader, a registered professional engineer, was responsible for planning the inspection procedures so that the water tower structural components were properly inspected. The weather was sunny with a 60 degrees F temperature and winds between 9 and 20 mph. Ten photographs documenting the inspection are attached to this report.

A visual inspection of the structural members and their connections was performed using a 135-foot personnel lift (Photo No. 2). Where access was possible, a hands-on inspection was performed including recording the thickness of structural members and the water tank using an ultrasonic measuring device and a basic caliper, to determine possible section loss due to corrosion.

Glossary of Inspection Terminology

- 1) **Corrosion**
 - a) Minor (or light) - A light surface rust.
 - b) Moderate - Rust that is loose and flaking with some pitting. This scaling, or exfoliation, can be removed with some effort by use of a scraper or chipping hammer. Element exhibits measurable but not significant loss of section.
 - c) Severe - Heavy, stratified rust or rust scales with extensive pitting. Removal requires exerted effort and may require mechanical means. Significant loss of section.
- 2) **Pack Rust** - Rust collected between two interfacing surfaces, usually two steel plates. Pack rust can be minor, moderate, or severe as described above. Pack rust can severely deform the steel members due to the expansive nature of rust.
- 3) **Pitting** - Formation of cavities due to corrosion. Minor, moderate, and severe pitting categories are used based upon depth and density of cavities.
 - a) Minor - Typically less than ¼ inch diameter and 1/32 inch deep.
 - b) Moderate - ¼ inch to ½ inch diameter and up to ⅛ inch deep.
 - c) Severe - Greater than ½ inch diameter and over ⅛ inch deep.

SUMMARY OF FINDINGS

The existing water tower is overall in good condition exhibiting mostly minor corrosion throughout, with only minor loss of material and no observed missing rivets. Pitting of material due to corrosion was not found. The original field paint coatings have peeled off, revealing the shop graphite primer coating that partially remains throughout the tower structure.

The tower anchors are in overall good condition with the northwest and southwest anchors exhibiting moderate pack rust at the stiffener plates and moderate corrosion on the base plate (Photos Nos. 3 & 4). The anchors for the northeast and southeast posts are partially buried by the soil and exhibit moderate corrosion on the stiffener plates (Photos Nos. 5 & 6). The horizontal rods located at the level of the anchor base have been removed or have become loose (Photo No. 4); however, the current state of these rods does not compromise the structural integrity of the water tower.

The posts are in good condition, exhibiting minor to moderate corrosion overall. Only the

northeast post is exhibiting moderate corrosion on one of the channels near the base of the post. The layers of corrosion were removed to record the thickness of the channel web, which revealed approximately 10 percent section loss of the web area (Photo No. 7). The post splice connection plates, struts and bracing channels, and cross rods are all in good condition, exhibiting only minor corrosion (Photo No. 8) and the connection to the tank is also in good condition (Photo No. 9). The tank is in overall good condition, exhibiting minor corrosion with approximately 10 percent section loss on the tank's cylindrical plates (Photos Nos. 9 & 10).

CONCLUSION AND RECOMMENDATIONS

As noted in the Summary of Findings, the water tower is in overall good condition with only minor corrosion throughout and some section loss on one of the posts and the water tank. These losses are considerably small given the age of the structure and are not considered significant. In addition, the water tank no longer stores water and the stresses on the steel members are significantly less than that for which they were designed. As such, given the condition of the water tower, it should be able to withstand being dismantled and re-erected if properly performed by a competent Contractor who can demonstrate pertinent project experience.

As stated in the Project Scope, the Village may either restore the water tower or replace it with a replica following the completion of the site cleanup. If The Village decides to dismantle, restore, and re-erect the water tower, Louis Berger recommends that the project scope include at a minimum, but not be limited to:

- A lead paint survey of the water tower structure and lead paint abatement in compliance with all applicable regulations, as necessary, for dismantling, restoration, and re-installation.
- Identification and application of an appropriate finish to preserve the water tower structural elements from additional corrosion after re-installation.
- Construction of a new water tower foundation and cleaning and painting of all four anchors up to 3 feet from each anchor base plate.

Please contact Len Warner with any questions regarding this report at (914) 798-3721.



Photo No. 1: View of the Water Tower looking west.



Photo No. 2: View of the Water Tower and personnel lift looking west.



Photo No. 3: Northwest post anchor exhibiting moderate pack rust at the stiffener plates and moderate corrosion on the base plate. Note concrete foundation.



Photo No. 4: Southwest post anchor exhibiting moderate pack rust at the stiffener plates and moderate corrosion on the base plate.



Photo No. 5: Northeast post anchor partially buried and exhibiting moderate corrosion on the stiffener plates.



Photo No. 6: Southeast post anchor partially buried and exhibiting moderate corrosion on the stiffener plates.



Photo No. 7: Northeast post exhibiting moderate corrosion. The layer of corrosion was removed from a testing location to record the thickness of the channel web, revealing approximately 10 percent loss of web area.



Photo No. 8: Typical post splice connection plates, struts bracing channels and cross rods exhibiting minor corrosion.



Photo No. 9: View of connection between tank and post in good condition.



Photo No. 10: View of tank lower section exhibiting minor corrosion.
Note recording of tank plate thickness using the ultrasonic measuring device.