

# Historic Fort Pitt Block House

## Case Study - Computed Radiography Application



### TÜV RHEINLAND'S COMPUTED RADIOGRAPHY EXPERTISE BENEFITS HISTORIC SITE

#### **Fort Pitt Block House in Pittsburgh, Penn., Kicks Off Preservation Work with X-Ray Exam**

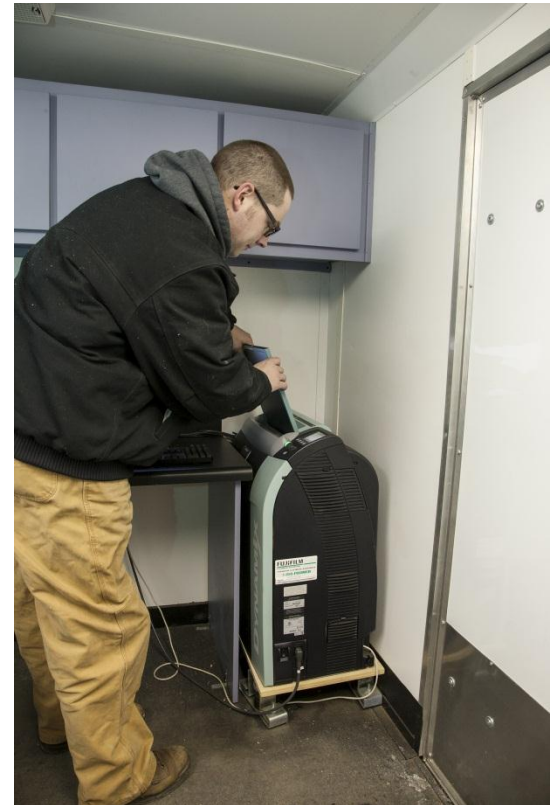


The team at TÜV Rheinland Industrial Solutions (TRIS) in North America is an old hand at using computed radiography to assess structural integrity of welded material and castings, including piping systems, tanks, pressure vessels and steel bridge components. As a non-destructive test, radiography has many other useful applications. Now and then, the staff gets a chance to perform "industrial" radiography on non-traditional items, such as electronics, safety devices and firearms. Included are even a dinosaur and an old picture, which the team X-rayed to determine if another painting was concealed underneath. The Fort Pitt Block House in Pittsburgh, Penn., was one of such non-traditional applications: It was the first site where TRIS put its skills to work to diagnose the health of a historic structure.

The Block House is all that remains of Fort Pitt, the largest and most elaborate British fort in North America built in the last days of the French and Indian War in 1764. Given to the Fort Pitt Society of the Daughters of the American Revolution of Allegheny County in 1894, the Block House has remained free and open to visitors from around the nation and the world for over a century.

The Fort Pitt Society kicked off its conservation efforts in 2013 to get the structure in top shape for its 250<sup>th</sup> anniversary the following year. Much of the architectural fabric of the two-story building was intact, featuring mostly original stone foundation, bricks and timbers. The solid walls of the structure were punctuated by wooden gun loops that gave the defenders stationed in the Block House a 360-degree view around the building. The loopholes allowed the soldiers to fire their muskets at enemies trying to attack.

The Society intended to preserve the gun loop timbers and needed to know their condition to determine the scope of restoration work. It contracted with TRIS to carry out the radiographic inspection of the original wood in the fort.



*Aaron Drake, Radiographer, is feeding an imaging plate from a previous exposure of the gun loop into the computer processing unit, which converts the plate to a digital file.*

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“After evaluating the local firms capable of performing the necessary radiographic work at the Fort Pitt Block House, I recommended going with TÜV Rheinland/TRIS because I felt they had the most experience in this specific area and their product samples had the highest quality,” said Dirk Taylor, of Taylor Structural Engineers, Inc., the structural engineer overseeing the Block House restoration project.

Unlike conventional, or film, radiography, computed radiography is a digital X-ray process that offers a more precise imaging with a greater picture enhancement. Conventional radiography captures the image on a piece of film (much like when one goes to a dentist), whereas computed radiography captures the image on an image plate that allows the picture to be digitized.



*Radiographic crew members Jake Fetchin, Assistant Radiographer, (left) and Phil Martin, Radiographer, (right) are performing a radiation survey of the equipment to ensure the radioactive material is returned to its safe and shielded position.*



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“We take a radioactive material source that passes through the wood, from inside to outside, and is transferred to the imaging plate on the other side,” explained TRIS Radiation Safety Director Chris Dugan. “Then we take the exposures, pick them up, and take them over to the mobile unit, where they appear on a video screen.”

The video screen shows a picture-like image representing density variations in the wood; a lighter area would show a “healthy” material while a darker area would indicate decay, insect damage, rot and other potential impairs.

Computed radiography allows a variety of viewing “tools” to be used to enhance the inspector’s evaluation: an image can be enlarged, discontinuities can be accurately measured, shading can be adjusted to highlight areas of interest, and much more. Additionally, computed radiography eliminates the need for using chemicals for developing film, a bonus for eco-conscious organizations. The digitized file can be archived on a CD, which is a more reliable way of storing information than on film, which can degrade over time.



*Phil Martin, Radiographer, is setting up the imaging plates for the next exposure during the radiographic inspection of the gun loops at the Fort Pitt Block House*

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“The technicians from TRIS were very professional and easy to work with,” Taylor said. “We appreciated their sensitivity to the unique needs of this project and the delicate nature of the materials being studied.”

Fortunately for the Fort Pitt Block House, the X-ray “exam” showed that the gun loops did not have any significant internal wood deterioration to require complicated internal structural repairs. Rather, wood deterioration worked its way from the exterior surfaces inward, requiring only relatively simple repairs applied to the surface. In addition to the structural repairs, the preservation experts specified treating the wood with a borate-based preservative for future protection against water and insect damage.

“Working to help preserve an important national landmark was very rewarding,” said Dugan. “It’s good to know that modern technology and expert knowledge can save the 18<sup>th</sup>-century timbers for the future generations.”

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