Wood assessment and historical research on timber testing at Fort Adams, Newport, Rhode Island, U.S.A.

Kimberly D. Dugan[1], Derek Trelstad[2], Ronald W. Anthony[3]

Abstract Fort Adams, located in Newport, Rhode Island, USA, designed by French military engineer Simon Bernard and American military engineer Joseph G. Totten, was constructed from 1824 - 1857. Construction was overseen by Totten from 1824 through 1838. Built of stone, brick, and timber, the fort served as a testing laboratory for determining the strength of various types of stone, mortar, and timber species. An investigation was undertaken to assess the current conditions of the timber and investigate the historical significance of the testing programs developed by Totten. This paper focuses on three aspects of the project: (1) The timber testing program and its implications for construction of the fort and subsequent timber testing in the U.S. (2) Using nondestructive testing to identify causes and patterns of deterioration, and recommending actions to extend the service life of the historic timbers. (3) Correlating the findings of the condition assessment with the published results of Totten's experiments.

Keywords nondestructive testing, condition assessment, timber testing, Fort Adams, Totten

1. EXTENDED ABSTRACT

Fort Adams, located in Newport, Rhode Island, U.S.A., is referred to as a Third System coastal fortification. Lacking American engineers, the fledgling U.S. recruited foreign-born miltary engineers for the design of most military fortifications. This reliance on foreign-educated engineers was a primary impetus for the establishment of a military academy at West Point in 1802. Following the War of 1812, Third System coastal fortifications began to be constructed. Typically based on a combination of the Montalembert and the Vauban concepts, construction of Third System forts was generally overseen by officers of the army's Corps of Engineers. Fort Adams is the most complex and the second largest of the 42 Third System coastal fortifications constructed between 1821 and 1867.

Designed by French military engineer Simon Bernard and American military engineer Joseph G. Totten, Fort Adams was constructed between 1824 through 1857. Construction was overseen by (then) Col. Totten from 1824 through 1838. Built primarily of stone and brick masonry and structural timber, the fort also served as a post-graduate training facility for engineers trained at

[1] Kimberly D. Dugan, Preservation Specialist, Anthony & Associates Inc., USA, kim@anthony-associates.com
[2] Derek Trelstad, Associate , Robert Silman Associates P.C., USA, trelstad@silman.com
[3] Ronald W. Anthony, Wood Scientist, Anthony & Associates, Inc., USA, woodguy@anthony-associates.com

the United States Military Academy (also known as West Point) as well as a testing laboratory for determining the strength of various types of building materials native to the U.S. – particularly stone, mortar, and timber.

The historically significant timber testing program conducted at Fort Adams dates to the nascent years of mechanical testing of wood in North America. It was conducted at a pivotal time prior to the Industrial Revolution in the U.S. and the development of standardization. The testing program at Fort Adams appears to be the first widely published mechanical testing of native American tree species and offers a unique opportunity to understand scientific thought and materials testing in pre-Industrial Revolution North America. Totten's role in creating an experimental laboratory for West Point graduates at Fort Adams helped to foster a new generation of U.S.-trained engineers, who, in the decades following the Civil War, vastly expanded the science of strength of materials.

Fort Adams was used by the U.S. military until after W.W. II, and some of the nearby buildings housed naval officers into the 1960s. It has been owned by the State of Rhode Island since it was decommissioned and operated by several not-for-profit groups that conduct tours of the fort and faciliate rental for special events. The fort has remained largely empty since the 1960s and several areas have fallen into disrepair. Repairs to the fort have been made as the need arose and as funds were available; most recently the Fort Adams Trust has installed a new roof on the Northeast Bastion and Officers Quarters (at the East Curtain) and restored some interior spaces.

Because Fort Adams represents a unique combination of architectural, historical, and cultural significance, Fort Adams Trust (the current stewards of the Fort) retained a team of heritage conservation conultants, including Anthony & Associates, Inc. and Robert Silman Associates, P.C., to assess the current conditions of the timber within the fort, as well as investigate the historical significance of the testing programs developed and led by Totten. This paper focuses on three key aspects of the project:

(1) Documenting the timber testing program conducted at Fort Adams in the nineteenth century and its implications for construction of the fort and subsequent timber testing in the U.S.
(2) Using nondestructive testing to assess the condition of the timber; identify causes, types, and patterns of deterioration; and guide development of actions to protect the historic timbers.
(3) Correlating the findings of the nondestructive testing on the original timber components of the Fort with the published results of Totten's experiments.