NAVFAC INDUSTRIAL HYGIENIST ASSISTS IN THE CLEAN UP AND RESTORATION OF FLOODED NRC BALTIMORE

Fort McHenry, the teardrop-shaped, 43-acre peninsula that juts out into the harbor at Baltimore, Maryland, is the only American National Monument that is also a Historic Shrine. During the War of 1812, the British Navy detained American patriot Francis Scott Key while they bombarded Fort McHenry. Key watched as the Americans fought off the attack, keeping the port of Baltimore out of enemy hands. At dawn, with the battle over, Key caught sight of the Stars and Stripes, still flying over the fort. That image of the American flag inspired Key to compose *The Star Spangled Banner*.

Fort McHenry National Monument and Historic Shrine (foreground) sits on teardrop-shaped peninsula

More recently, Hurricane Isabel blew through Baltimore, flooding Naval Reserve Center (NRC) Baltimore, which is located on the Fort McHenry compound. The hurricane's storm surge sent water crashing through the NRC complex, swamping all of its buildings in two feet of murky seawater. The underground utility tunnels that connect the reserve center with the fort were also under water.

Naval Reserve Center Baltimore was flooded due to a storm surge during Hurricane Isabel

With NRC's operations at a standstill, NRC Baltimore's parent command, Naval Reserve Readiness Command Mid-Atlantic Region (REDCOM Mid-Atlantic) requested the Naval Facilities Engineering Command (NAVFAC) to send its Engineering Field Activity Northeast (EFANE) to assess the

flood damage and get the reserve center up and running again. The following day, EFANE sent industrial hygienist Thom Snyder and an environmental restoration contractor to assess the flood damage at NRC Baltimore and to begin planning the clean up and restoration project.

Industrial hygiene is the scientific discipline dedicated to the prevention of occupational diseases and injuries. Industrial hygienists identify and evaluate the health and safety risk factors associated with chemical, physical, and biological hazards in the workplace, and develop plans for eliminating those hazards or minimizing the risks. The U. S. Navy employs industrial hygienists primarily to manage those sections of the Navy Occupational Safety and Health (NAVOSH) Program that require identification and assessment of risk factors associated with workplace health hazards. The role of the Navy's industrial hygienists varies from project to project, but their mission remains the same: to protect the Navy's active duty, reserve, and civilian workforce.

View of flood debris in front of NRC Baltimore following Hurricane Isabel

After the NRC Baltimore site visit, the race was on to develop a scope of work to get the reserve center back on track as quickly as possible. The NRC staff, the industrial hygienist, and the environmental contractor worked out the logistics of getting NRC staff and reservists onto the second and third levels of Building 3, the reserve center's main building, without tracking contaminants in with them. Temporary ventilation was installed, and a side entrance was decontaminated and isolated from the flood-damaged first floor. As a result, staff and Naval Reservists assigned to NRC Baltimore were back in business while the clean up and restoration continued in the rest of the building.

Standing water and wet materials encourage microorganisms, such as mold, to grow and reproduce, creating a possible health hazard. The term *mold* refers to a group of fungi, microscopic life forms that grow only in damp or wet locations. Unless it is completely destroyed, mold continues to damage contaminated objects long after floodwaters have receded. Exposure to some types of mold can cause illness, including

allergic reactions or asthma attacks in persons who are especially sensitive to mold.

The U. S. Environmental Protection Agency (EPA) recommends moving quickly to minimize mold growth. The EPA recommends starting the clean up of indoor water damage within 24 to 48 hours after a storm passes, and after the responsible public safety agency has determined it safe to enter flooded structures. The Navy considers the health risks associated with mold sufficient reason to clean up and dry out or remove water-soaked materials as soon as possible after flooding or a major water leak.

Flood-damaged documents were removed for salvaging by gas sterilization and freeze drying

Mr. Snyder made certain that cleanup and repair work incorporated safe removal and proper disposal of water-damaged building materials and furnishings to prevent the growth of mold and other microorganisms. During the site assessment, Snyder and the environmental restoration contractor determined that every surface up to two feet from the floor on the first level of Building 3 had been saturated with *black water* from the harbor. *Black water* is a term for dirty water that may contain health-hazardous pollutants such as petroleum products, other chemicals, sewage, or various kinds of organic debris. Prior to starting any repairs, the contractor used a high-pressure disinfectant to clean all surfaces that had been in contact with black water.

Discharge pump helped to remove floodwater from first floor of NRC Baltimore

The clean up crew disposed of all floor coverings and wallboard up to four feet from the floor. Insulation and other porous materials were discarded as unsalvageable. Nonporous surfaces were washed under high pressure with a disinfectant; heat, fans, and dehumidifiers were then used to dry those surfaces, eliminating any remaining mold. The waterlogged contents of the outdoor hazardous materials storage lockers were disposed of as hazardous waste; the lockers were then decontaminated, dried out, and reused.

Important NRC records and documents, such as building plans and military service records, were also waterlogged. Thanks to freeze-drying technology, they have been restored. Freeze-drying is a restoration process that was developed for museum curators and archivists to save priceless artwork and historical documents from moisture or water-damage. NRC's salvaged documents were also decontaminated, using gas sterilization, to eliminate the risk of disease from black water contaminants without risking further damage to the documents.

Commander Don Plows, REDCOM Mid-Atlantic Region's Facilities Management Officer, thanked NAVFAC and the EFANE clean up and restoration team for getting NRC Baltimore rapidly restored to its pre-flood state. Due to NAVFAC's response and its expert project management, the reserve center was dried out, cleaned up, and restored within three months of the flooding caused by Hurricane Isabel at the Fort McHenry compound. Mr. Snyder's identification of the health risks associated with the flood and his supervision of the cleanup, prevented mold and black water pollutants from harming building occupants and avoided additional damage to reserve center property.

Naval Facilities Engineering Command's contract workers clearing out floodwaters at NRC Baltimore

NAVFAC's Safety and Health team provides information on preventing and cleaning up mold contamination at their website, http://www.navfac.navy.mil/safety/site/topics/mold.htm. The website also links to other useful sites on understanding mold and managing mold-related problems.