IN-PLACE INFRASTRUCTURE REPAIR TESTIMONIALS

BACKGROUND:

- The following testimonials focus on one of the several products that can be used under the proposed In-Place Infrastructure Repair Pilot Program.
- The product selected has been in use for 30 years. **Its current treatment system was developed in collaboration with NASA. It has been used successfully by NASA, the Department of Defense, and U.S. Army Corps of Engineers, among other local, state, and federal agencies.**
- **Purpose of the testimonials is to illustrate the effectiveness, cost-savings, and extended useful life that products certified under the In-Place Infrastructure Repair Program would provide.**

NASA

NASA Center: Kennedy Space Center, 1998 - Reference Number: KSC-SO-31, Environment and Resource Management, "Corrosion Resistance on Launch Pads at Cape Canaveral"

Billions of dollars' worth of structures are literally eaten away by corrosion. To fight this destruction, **a Space Act Agreement between Kennedy Space Center and SURTREAT®** merged Kennedy Space Center research, tied to electrical treatments of structural corrosion, with chemical processes developed by SURTREAT, Inc. of Pittsburgh, PA. The combination of technologies has resulted in a unique process with broad corrosion-control applications. As the "NASA Spinoff" reports state:

- *"… of all the concrete in … NASA's field centers, probably none has it harder than that in the structures at Kennedy Space Center. Not only is the seaside campus … constantly bathed in damp, salty air, but some of its concrete is in and around the Cape Canaveral launch pad, where rocket boosters blast it with white heat, hydrochloric acid, and other hazards, while it's simultaneously sprayed with water for cooling. For these reasons, in February 1996, Kennedy entered into a Space Act Agreement with Surtreat to test its products … Joe Curran, a NASA-contracted corrosion engineer at Kennedy, set up the testing …*
- ***"Surtreat's vapor-migrating inhibitor was a top performer and was subsequently used on Kennedy's Launch Pad 39A and other reinforced concrete structures at the space center …***
- *"NASA has also developed a new technology that will further advance these efforts – a liquid … coating applied to the outer surface of reinforced concrete to protect the embedded rebar from corrosion.* ***Surtreat licensed this new coating technology*** **[known as VCI Coatings primer]** ***and put it to use at the U.S. Army Naha Port, in Okinawa, Japan.***
- ***"The new coating prevents corrosion of steel in concrete in several applications, including highway and bridge infrastructures, piers and docks, concrete balconies and ceilings, parking garages, cooling towers, and pipelines …***
- ***"Ten years later, NASA is still using this combined approach to fight concrete corrosion …"***

U.S. ARMY CORPS OF ENGINEERS

US Army Corps of Engineers®

Based on NASA's recommendation, the U.S. Army Corps of Engineers (USACE) provided SURTREAT® with a grant to incorporate its corrosion inhibitors into the USACE's military spec primer for coating rusting steel.

- The coating was evaluated by the U.S. Army Corps of Engineers in 2012 and was found to be effective on rusty surfaces to the point that it **offered 5-10 times the corrosion-inhibiting properties** of a standard primer.
- **SURTREAT'S chemical corrosion inhibitors have been incorporated in the approved specifications used the Federal Highway Administration and the *Unified Facilities Guide Specifications* used worldwide by the U.S. Military.**
- SURTREAT further partnered with the USACE by commencing a 10-year study of SURTREAT's technology applied on structures within two U.S. military installations in Okinawa, Japan.

U.S. Navy – U.S. Army Corps of Engineers - 6/8/2016

Final Report for N62470-14-D-3006 at U.S. Military Installations Okinawa, Japan - Prepared for Naval Facilities Engineering Command, Project No 340531156,

- *"Because corrosion of steel reinforcement is an ongoing expensive maintenance issue, effective treatments are studied to reduce the impact of corrosion on military infrastructure. The structures selected for this test are in particularly corrosive coastal environments. Two project sites in Okinawa were selected due to the harsh environment and visible deterioration of concrete …*
- *"A series of compressive strength measurements were made … The average measured value was 5200 psi, which is an increase from the previous measurements … We compared the most recent corrosion rate … 6 months after treatment, and … 3 years after treatment. The 3-part SURTREAT system … is effectively protecting the rebar from corrosion. To date, an average reduction in the corrosion rate by 79 to 80% has been realized.*
- ***"Results: Over 10 years later the concrete is stronger than when first poured and corrosion has been reduced … 80% which will significantly extend the life of these assets."***

Purdue University, Emerging Technologies, ECT Fact Sheet, "SURTREAT® - Concrete Restoration & Protection," 2007

- *"The most direct measurement of the corrosion rate, polarization resistance, was increased by 300% after application of Surtreat.*
- *"Half-cell potential and corrosion current measurements also reflect a significant decline in corrosion rates after application of Surtreat corrosion inhibitors.*

Project Cost Comparison	Surtreat	Alternative*	Savings
Albright Parking, Columbus, OH, Parking Structure Rehab, 1990	***$173,500***	***$1,400,000***	***88%***
Port Authority, Pittsburgh, PA, Bridge Foundation Restoration, 1991	***$32,000***	***$240,000***	***87%***
U.S. Department of Energy Nuclear Site Fernald, OH – Storage Pad Protection, 1995	***$170,000***	***$510,000***	***67%***
Essex Waste Management Warehouse Floor Protection, 1996	***$31,617***	***$250,000***	***87%***

*"*Alternative Cost" describes the restoration estimate based on an engineering study or the lowest bid."*

Research and Development, University of Pittsburgh, Applied Research Center

The SURTREAT system has been used successfully by utilities, nuclear storage facilities, water treatment plants, port authorities, and airports. Representative projects include St. Luis Pass Bridge, TX; Alcosan Wastewater Treatment Plant, PA; and the Eskom Nuclear Power Plant in South Africa.

- ***"The coating lasts 10 years or more, reducing maintenance costs over the lifetime of the structure;*** *… testing has proven that the treatment yields reductions in rebar corrosion potential, water penetration, chemical reactivity, and water-soluble chloride, while generating increases in hardness, flexural strength, and pH levels.*
- ***"The treatment also provides resistance to chloride penetration and problems associated with freezing and thawing of the porous structures.***
- ***"The solutions used are water-soluble and environmentally safe,*** *and in testing have shown no effect on the turbidity, pH, or dissolved oxygen content levels in water.*
- *Surtreat's formulations bond inorganic compounds to structures, where they become part of the steel and concrete matrix indefinitely.* ***It leaves no residues, coatings, or materials that could potentially harm humans, animals, fish, or the environment."***

This is just one of the products that could provide significant benefits under the In-Place Infrastructure Repair Program