Summary
The Overfalls Foundation is in need of an Impressed Current Cathodic Protection system to protect the Lightship Overfalls and its steel bulkheaded slip from galvanic corrosion. The cost of such a system installed is $60,200. The Foundation intends to apply to the Longwood Foundation for a grant of $30,000 and seeks $30,000 of TAP funding to match the Longwood funds. In the event that the Longwood grant application is not successful, the Foundation will try other non-governmental sources for the remaining $30,000.

Overfalls Foundation Background
The group started in 1999 and incorporated as a nonprofit foundation in 2001. The Foundation’s first objective was to save and preserve the Lightship Overfalls, at the time a rusting hulk in a muddy hole. Simultaneously with an immediate thrust to improve the ship, the Foundation initiated an aggressive outreach program telling the story of the ship and the crews who served aboard to audiences of all ages. The outreach program both brought visitors to the ship and took the story to school and civic groups at their locations. As the appearance of the ship improved, financial support for the effort from both private and public organizations kept pace. By 2010, the ship’s basic restoration was completed and the grounds were improved to blend seamlessly with the new Lewes Canalfront Park. The next year, the ship was designated a National Historic Landmark. Also in this period, the Foundation established the Delaware Maritime Hall of Fame to recognize those individuals who have made significant contributions to the State’s maritime heritage. In 2014, the Foundation dedicated the American Lightship Museum in a restored pilothouse saved from a historic Lewes vessel. The museum houses the Foundation’s growing collection of lightship artifacts which reinforce the story told with the ship and expands that story to all U.S. lightships. In 2015, came the dedication of the Monomoy Lifeboat which Foundation volunteers had restored from derelict to new and seaworthy condition. The boat will expand the Foundation’s reach as it will be used for teaching seamanship and water safety, with emphasis on local youth. The entire program since the beginning has been done with volunteer labor as the Foundation has no paid employees.

The population served has grown steadily over the years from mostly local folks to those from a wider geographic area. In many cases, the Lightship has served as a destination for groups from afar, some even making it an annual event. As the numbers have grown, the proportion of those that are children has grown too, a phenomenon which the Foundation is working to increase even more.

All of the Foundation’s major program elements, the Lightship, the American Lightship Museum, the Monomoy Lifeboat and the Delaware Maritime Hall of Fame clearly fit within the mission statement which is: “Using the Lightship Overfalls as its centerpiece, the Overfalls Foundation will collect, preserve, honor and teach the maritime history of the Delaware Bay and coastal region.”
Project Description
The Foundation seeks funding to acquire and install an “Impressed Current Cathodic Protection (ICCP) system to protect the Lightship Overfalls and its steel bulkheaded slip from galvanic corrosion. When the ship was in the shipyard in 2008, a series of 40 replaceable zinc anodes were installed below the waterline to inhibit galvanic corrosion. These work in a sacrificial manner where the zinc will corrode instead of the steel hull plates until the zinc is completely corroded away. The zincs are somewhat effective but don’t serve the ship well for two major reasons: (1) Given the ship’s infrequent shipyard trips (every eight to ten years), the zincs are not replaced as often as they should, and (2) zincs are not nearly as effective at inhibiting galvanic corrosion as an ICCP system. Currently the bulkhead has no protection against such corrosion. The Foundation recently employed professional divers to come to the ship and replace as many of the ship’s zincs as they could access. The effort was not considered successful as they could only gain access to eight leaving the ship largely unprotected. The Foundation then queried its peer organizations with similar problems finding that an ICCP system is by far the best protection available for our type of environment. The Appendix has additional details about galvanic corrosion and ICCP systems as well as our peer organization’s experience with such systems.

The Foundation then solicited proposals from manufacturers of ICCP systems all were priced around $60,000. The best proposal was from Anode Solutions for three major reasons: (1) the proposal covered equipment and installation as opposed to equipment only with responsibility for installation falling to a local third party which the Foundation would have to employ separately, (2) Anode Solutions would commit to a continuing relationship of performing the system’s needed annual maintenance, and (3) Anode Solutions is the preferred provider among our peer organizations responsible for preservation of historic steel ships.

Anode Solution’s proposed price for two systems, one to protect the ship and other to protect the steel bulkhead is $60,200. The Foundation seeks funding to cover this cost. Anode Solutions would also provide the ongoing annual maintenance for between $1500 and $2000 per year. The maintenance cost is an item that the Foundation would cover in its annual operating budget.
Appendix

Additional Details
Periodically the Lightship Overfalls has to go to a shipyard heavy maintenance which requires that the ship to come out of the water. The scheduling of such trips is dictated by an underwater inspection of the ship done by professional divers. In the spring of 2016, the report from the divers was that this would be the year. Immediately the Foundation started making all of the preparation to make this happen (schedule a shipyard, arrange for a tow, coordinate with the U.S. Coast Guard, dredge the slip so the ship would float, etc.) Many of these details are items are not under the Foundation’s control. By the time the Foundation received the permit which would allow dredging, all of the firms with appropriate capability were booked up for the 2016 season forcing a one year delay in the shipyard visit.

One of the most critical tasks in the shipyard visit is to replace the sacrificial zinc anodes that reduce galvanic corrosion of the ship’s steel hull plates. The zins, installed below the ship’s waterline, will corrode before the surrounding steel so, as long as there is zinc left the steel is less susceptible to galvanic corrosion. The ship has 40 such zins installed.

When it became obvious that the shipyard visit would be delayed until 2017, the Foundation had the divers come back to replace as many of the corroded zins as they could access. Because of silting in over the years, the mud level in the slip is very high and the divers were only able to gain access to and replace eight zins, all of which were totally corroded away. The photo on the next page shows a new zinc, an old one with the zinc all corroded away and a ruler to put it all in context. The net result is that the underwater hull of the ship is highly at risk for more than normal corrosion. This set the Foundation on an urgent course of learning as much as possible about galvanic corrosion and how to minimize it.

The urgent course entailed literature searches, consultation with experts and querying our peer organizations responsible for care and preservation of historic, steel ships. Ultimately it led to soliciting proposals from firms that design, develop and install state-of-the-art systems to minimize galvanic corrosion. While the Foundation examined countless documents and had many conversations, key elements of this quest for information are documents included in the Attachments to this Appendix. The documents are:

- **Preservation of Iron Ships in the Marine Environment** This document discusses galvanic corrosion in general, what it is, what causes it and how to minimize it.
- **USS Texas** This is a statement of what the Battleship Texas has for cathodic protection and their experience with it.
- **USS Missouri** This is a testimonial from the Battleship Missouri with their experience and recommendation related to Cathodic Protection.
- **Survey Results for Lightship Overfalls and Cathodic Protection** This document has explanations and experiences from five more historic ships and one certified marine surveyor.
- **Anode Solutions** This is a proposal from Anode Solutions to design and install a cathodic protection systems on the Lightship Overfalls and the ship’s steel bulkheaded slip.
The new zinc is above and the old one is below. What is left of the old one is the steel bar on to which the zinc is molded.
Preservation of Iron Ships in the Marine Environment

Don Birkholz
Tri-Coastal Marine

What Hath Man Wrought?

Long-term preservation is a difficult objective for anything that resides in an exposed environment, and this is particularly true for ships in the marine environment. Wooden ships are often considered the most problematic, being of materials that are intended by Mother Nature to rapidly degrade, and to which task she dispatches legions of insects, funguses, bacteria, and marine animals. Yet iron ships, while not subject to such organic onslaught, are hardly less ephemeral. To understand why, we need to look at the material, iron, in both a general and specific sense, and to consider the realities inherent in any preservation effort.

When man produces iron to build a ship he is taking a relatively stable substance - iron ore - and purifying it until it becomes an unstable substance, so unstable in fact that it wants to decompose in the presence of oxygen. A nearly omnipresent element, oxygen is hard to get away from on this planet (some ships have done so, but only by great misfortune) and, as if that is not bad enough, these creations are then tossed into one of the most corrosive environments there is - sea water.

Of course the men who built these ships were not overly concerned with this -- they were intent on transporting cargoes or fighting battles on the high seas. They valued the superior strength of iron and probably expected no more than a 20 to 30-year life cycle for their creations. But this is the reality we face as preservationists today, given a mandate to preserve "in perpetuity" objects that were never expected to significantly outlive their creators. Despite a generally high quality of initial construction, most historic ships built of iron or steel have already suffered appreciable deterioration, and many of these have yet to reach the 100th anniversary of their launching -- relative youngsters.

The Nature of the Problem

The historic ships under discussion here range from iron sailing ships of the last century to the welded steel ships of the W.W.II era. The vessels that are the most troublesome and idiosyncratic are the riveted ships of the 19th and early 20th centuries. For one thing, these ships often come into the hands of their preservation-minded caretakers only after suffering years of abuse or neglect (the Balclutha, Eppleton Hall, Wavertree, and Great Britain are among the many). Their partially deteriorated state, in itself, makes them more difficult to maintain. This is in contrast to the more recent military ships that were often (though not always) "mothballed" and carefully preserved for future use. The earlier ships are also more subject to loss of historic integrity, as their forged and riveted structures are harder to repair in kind. The result is that, over time, repeated repairs using alternative methods will alter the original character of the vessel. The following discussion primarily focuses on these ships, although most of the preservation problems, and possible cures, will apply to all iron and steel ships, whether riveted or welded.
The Enemy: Corrosion

The old saying "corrosion never sleeps" is definitely true, but may be a little understated; corrosion actually appears to go on binges. Coatings are the primary line of defense against corrosion; they work to keep oxygen and moisture away from the metal. Fortunately we are living in the golden age of protective coatings; zinc-based primers and high-build epoxies have vastly improved the effectiveness, and extended the life span, of anti-corrosive coatings. Perhaps more importantly, many of the new coatings are "surface tolerant", meaning they can be applied over a less-than-well prepared surface. In some cases, this can eliminate the headache of having to sandblast. A detailed discussion of coatings is beyond the scope of this paper. Suffice to say that one should stay abreast of the advances being made in the field, either by contacting the technical staff of the major paint companies specializing in marine coatings, or by contacting a professional trade organization, such as the Steel Structures Painting Council.

The Underwater Hull

The portion of an iron ship most vulnerable to corrosion is the underwater hull, and this is where corrosion can have the most catastrophic effect. Along with coatings, an effective weapon for preserving the underwater hull is cathodic protection. This is another area where major advances have been made -- the traditional system of using sacrificial anodes has been largely replaced with the "impressed current" system, which pumps electrical current into the hull, turning it into a giant cathode and thereby preventing corrosion. Although impressed current systems have been around for many years, recent advances have been made in the automatic control systems that regulate them. The systems are now fairly reliable and easy to maintain. They will reduce corrosion to a minimum and significantly extend the period between maintenance dry dockings. Any ships afloat in sea water should be under the protection of an impressed current system.

Topsides

The impressed current system will not, however, protect a ship's topsides, which must continue to rely on anti-corrosive coatings. The area of greatest concern is the wind-and-water line, where the combination of wind and splashing sea water invariably causes severe corrosion and wastage (this is often the thinnest area of a hull and where leaks usually begin). The best and thickest epoxy coating is called for here, and will effectively protect the wind-and-water line unless it is mechanically damaged by ice, flotsam, or contact with a pier or another vessel. Measures should be taken to prevent such damage to the waterline area.

Bilges

Bilges are a common corrosion problem because they remain damp. If sloshing bilge water is present, the lower interior of the hull can suffer corrosion rates as severe as those of the wind-and-water line. Bilge water should be kept to an absolute minimum, and bilge areas ventilated to remove moisture. Even with these measures, getting paint to stick to bilge surfaces can be difficult. Some areas may call for a soft-film coating. Once applied, these coatings will make all surfaces extremely slippery. This type of coating is best used in areas that people are not expect to access frequently, such as engine beds or ballast tanks.

Many builders of iron vessels in the late 19th or early 20th century poured cement in the bilges as a protective coating. Compared to the best paint available at the time, cement served far better in protecting hulls from the corrosive effects of sloshing bilge water. Over time though, the system can fail as water gets in through fractures in the cement or along the thin edges where the cement terminates, usually at the turn-of-the-bilge. Moisture starts the corrosion process, and rust expansion lifts the cement in a vicious cycle that eventually spreads throughout the cemented area. This can lead to severe wastage of shell plating that, coupled with exterior wastage, can hole the hull. It may be difficult to tell whether this process is occurring - sounding the cement with a hammer will, in some
cases, produce a hollow sound, indicating the cement has lifted; in other cases, particularly where the cement is thick, the cement may sound solid while active corrosion is taking place beneath. Once water has gotten beneath the cement, it never dries out, ensuring that the corrosion will continue. About the only sure way of determining the condition of shell plating beneath cement is to remove the cement.

Galvanic Action

The term "galvanic action" is often used to describe a particular form of corrosion that takes place when dissimilar metals are placed in contact with each other, particularly in the presence of sea water. The result is wastage of the less noble metal. Due to minor dissimilarities between the composition of plates and rivets, galvanic action is often seen in the shell plating of riveted hulls that are afloat in sea water. This generally results in wasting of rivets, which tend to be less noble than the surrounding plate. This form of galvanic action is slow acting, but can result in severe wastage over time. One solution is to encapsulate the rivets and surrounding plate with a thick coating, such as a high-build epoxy, that prevents sea water contact, another is to employ the aforementioned cathodic protection system.

Electrolysis

Electrolysis occurs due to ground faults in a ship's electrical system. It can also occur due to stray currents from electrical sources near the ship. In either case, as current passes through a ship's hull, it takes some metal with it, resulting in pitting of the hull exterior similar to that caused by galvanic corrosion. With most permanently moored historic ships, electrolysis results from ground faults in the shore power system. Finding all the ground faults in a ship's electrical system can be daunting. An alternate solution is to install an "isolation transformer" in the electrical shore power line. This effectively keeps the faulty current from passing through the hull as it tries to get back to ground ashore, and does not require that all ground faults are corrected. Stray current from outside sources are more difficult to detect and correct, although the effects can be largely mitigated by the use of an impressed current cathodic protection system.

Rust Expansion

One of the weaknesses of riveted construction is the vulnerability of plate seams to corrosion. The joints between plates and other structural members cannot be completely sealed from moisture, even in shell plates that have been caulked. The result is that, over time, corrosion can lead to expanding rust scale that draws joints apart with tremendous force, shearing rivets or pulling the heads though the plate. This can present a problem for the surveyor, as it is often difficult to tell whether rivets still have attachment. For the preservationist, removing rust scale from joints can be difficult, and sealing off the joints nearly impossible. About the only lasting solution, although a costly one, is to remove the rivets, clean out and coat the seam, and re-rivet the joint. A hermetic seal, such as the thick epoxy coatings mentioned earlier, can then be used to seal off the seam.

Wood Decks on Iron Ships

Planked weather decks are a feature of most early iron ships. An ongoing conflict often exists between the maintenance needs of wooden decks and those of the surrounding ship -- wood decks are traditionally washed down with sea water to take advantage of the fungicidal properties of salt. This is robbing Peter to pay Paul in a big way because these same chlorides invariably result in corrosion of adjacent iron structures (hatch coamings, bulwarks, fittings). Wherever possible, an alternative to sea water should be used for deck maintenance. Unfortunately, some of the most effective wood preservatives are also toxic to humans. One safe alternative is sodium borate (sold as TIMBOR (R), a water-soluble preservative that is not corrosive to ferrous metals. Like any water-soluble product, sodium borate will tend to leach out of the wood over time. It therefore must be applied in an ongoing maintenance program in order to be effective.

As every wood deck that was ever laid upon a ship eventually leaks, corrosion is often found on the underlying plate or deck beams. There are few good solutions to this problem and once the corrosion

https://www.maritime.org/conf/conf-birkholz.htm
has pitted the tops of beams or plates, the steel-to-wood faying surfaces become irregular and hard to seal. One solution that appears to work is the use of a soft film coating to bed the planking -- Eureka Fluid, a brand of lanolin-based anti-corrosive coating, was used in this manner during deck repairs on the ship Balclutha in the 1960s, and again in the 1980s, and appears to have been successful.

Monitoring the Rate of Corrosion

To determine the degree of success of our preservation efforts, the rate of corrosion and attendant wastage of a vessel should be monitored closely. Visual inspections should be carried out on a routine basis, with particular attention to some of the problem areas noted above. Measuring shell plate thickness is probably the single most important method for establishing the overall condition and rate of deterioration of an iron hull. The tool of choice for this is the ultrasonic caliper, which measures the thickness of metal by sending an ultrasonic signal though the material. These tools have become cheaper and more sophisticated in recent years and would be a useful addition to the maintenance tool kit of any large vessel. The process of ultrasonic testing (UT) is straightforward, but difficulties are sometimes encountered when attempting to measure some types of malleable iron plate due to imbedded layers of silicone slag. These layers tend to bounce the signal back, thereby giving only a partial reading. An experienced operator can learn to accurately decipher these signals and some newer UT gauges can be calibrated to overcome this problem entirely.

Enough is Enough

If we are to be successful in preserving iron ships, we must accept that even a minor degree of corrosion is too much. A one-percent annual corrosion rate would perhaps have been acceptable to most ship owners a century ago, but will not achieve the goal of long-term preservation if we are looking beyond the next one-hundred years. Of course, the idea of preserving something "in perpetuity" is patently absurd unless we acknowledge the necessity of constant renewal. Yet, one of the principle values we place in these ships is the craftsmanship they exhibit, something that is not easily reproducible. Who can say what future technologies will bring to the field of maritime preservation -- perhaps a solution will be found for this dilemma, but until then, we should do all that we can to not loose our grip on what we have.

Return to the Preservation Conference Schedule page.
Battleship TEXAS has an impressed cathodic protection system that was analyzed, engineered, and reconfigured/replaced and is inspected monthly by ship staff and annually by Anode Solutions, who also did the analysis and reconfiguration/replacement. The two most important preventative measures a ship can do to prevent steel wastage are having good coatings and an engineered cathodic protection system- in the case of TEXAS, we have been unable to address our coatings since our last dry dock (1988-1990) so we are even more reliant on our cathodic protection system. We have been exceptionally pleased with the work of Anode Solutions throughout.

Andy Smith
Battleship TEXAS/ San Jacinto Battleground SHS
3523 Independence Parkway South, LaPorte, TX 77571
Phone: 281-479-2431 X 236

Life’s Better on a Battleship!
Click on the link to join us on Facebook
USS Missouri Testimonial

- Original Message-----
From: "Mike Carr" <mikec@ussmissouri.org>
Sent: Friday, December 16, 2016 11:45am
To: "Matt Woods" <mwoods@intrepidmuseum.org>, "Rocco Montesano" <rocco@usslexington.com>, "executivedirector@hnsa.org" <executivedirector@hnsa.org>, "jwilliams@labattleship.com" <jwilliams@labattleship.com>, "jcobb@ussalabama.com" <jcobb@ussalabama.com>, "exdir@battleshipnc.com" <exdir@battleshipnc.com>
Cc: "Jason Morrison" <jasonm@ussmissouri.org>
Subject: RE: Help with cathodic protection for Lightship Overfalls

Bill- Comments below from Jason- Our Chief Engineer

1. Corrosion of steel in water, especially in seawater/brackish water is an inevitability. Without doing something to slow/stop that process, preservation is fundamentally not even taking place.
2. Coatings (i.e.) paint provide a barrier to interrupt corrosion processes, but even the best-applied coatings eventually break down and require replacement; below the waterline, effective coatings renewal requires going into a dry dock, which is often a non-starter for a museum ship due to cost and possibly even structural concerns (for ships that are already in an advanced state of decay).
3. Absent the ability to renew/replace underwater coatings, cathodic protection then becomes the primary owner-controlled means of slowing/stopping corrosion under typical circumstances. Ideally, coatings and cathodic protection would work together. But for a museum ship that can’t go into dry dock, it’s quite possible that nothing else will do anything meaningful to fight corrosion.
4. And so cathodic protection for a steel museum ship becomes more than a matter of choice; it becomes an imperative.
5. Anode Solutions offers a cathodic protection solution that is more cost-effective to install and maintain than alternatives, and it is ideally suited to a ship that doesn’t move.

The only thing I’d add about our own “success” is that cathodic protection is a continuous point of emphasis. We put piles of our time and that of corrosion experts into making sure it’s working, expanding it, and improving it for the future. Our Ph.D. corrosion consultants look at cathodic protection data perhaps more than any other indicators of the health of the hull. Because it’s that important. Value-added isn’t even something we discuss; that’s a given going in.

Hope that helps. Happy Holidays

Mike Carr

Michael A. Carr
President & Chief Executive Officer
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Testimonials from Fleet Members and a Marine Surveyor

1. From Robert Howard, Operations Manager for Patriots Point (USS Yorktown and USS Laffey). Mount Pleasant, South Carolina:
   “The cathodic protection systems on our vessels are critical to slowing the corrosion process that all waterborne vessels experience. They are so important that we invest a great deal of time and funding in maintaining the systems properly. They are monitored weekly by our staff, and inspected quarterly by an independent engineer who is widely-recognized as an expert in the field and annually by both that engineer and the U. S. Navy’s inspection team. There is absolutely no question that without the cathodic protection systems the steel degradation and metal loss we experience would be much greater. Over time, cathodic protection systems save us money in deferred repair costs by slowing the corrosion process.”

2. From Joseph Lombardi, AMS. Marine Surveyor & Consultant, Ocean Technical Services, LLC, League City, Texas:
   “If all ships had this type system [cathodic protection] they would realize savings when it became time for dry-docking. Maintaining the system anodes and ensuring correct rectifier settings is a prerequisite.”

3. From Capt. Terry Bragg, USN (Ret.), Dir., USS North Carolina, Wilmington, NC
   “Here at the Battleship North Carolina we consider impressed cathodic protection to be mission essential for the long term preservation of the ship. Most believe the ship deterioration is caused by “rust” however in fact, most corrosion is caused by galvanic activity or ion exchange which is much more complicated than simple oxidation of surface metals.
   “Once installed by professionals, there is little maintenance and upkeep to keep a cathodic protection system operating as designed. When I assumed duties as Director of the Battleship North Carolina I researched the value added for cathodic protection and found two basic scenarios for this ship;
   - freshwater vs brackish environment (freshwater good – saltier water, not so good)
   - no cathodic protection, relying on aging paint systems – corrosion relative value: 10
   - installation of a modern state of the art cathodic protection system – corrosion relative value: <1
   “Following my review, we contracted with CORRPRO to install an updated system i.e. engineer a new system using our existing rectifier system (we had a system before) and a new anode string. Currently our system is turned off for cofferdam construction however we are in discussions with several companies to re-engineer our systems to include not only the ship but cathodic protection for the steel based cofferdam.
   “There are several vendors in our area – they do a lot of travelling in general, to include CORRPRO, Southern Protection and Anode Solutions. This project needs to be bid out with a formal RFP to get best pricing for a solution.”
4. **From Capt. Rocco Montesano, USN (Ret.) Dir. USS Lexington, Corpus Christi, TX**

   “We have had impressed cathodic protection since nearly day one. We have been here, in salt water, since 1992 and the hull remains in pretty good shape. The latest quote from the Navy “The yearly Cathodic protection inspection continues to indicate that excellent protection is being provided and the hull condition remains solid from the mud line to the water line.” We are also sunk in the mud anywhere from 15-20 feet. We use Lance and Anode solutions and attached is our latest readings.

5. **From Matt Woods, VP for Facilities, USS Intrepid, New York City.**

   “We installed an impressed current system in 2009 after drydock. The hull was in decent shape considering it had zero protection for 25 years, but it was sitting in a mud cradle and the water where we are in the Hudson is brackish. We saw some pitting at the wind and water line near the bow but the pitting at midships was insignificant as the hull is 2.5” thick. The company we used was out of New Jersey but they have since gone out of business. We are using Anode Solutions to tie the Growler into our IC system as we currently only have passive system on her.”

6. **From Mike Getscher, Operations Dir, USS Iowa, San Pedro, CA**

   “The former USS Iowa has been protected by Impressed Current Cathodic Protection (ICCP) consistently since the mid-1980’s when she received her built-in system from the Navy. Since decommissioning, she was maintained by several different inactive ship commands, all of which maintained the ICCP system in one or more forms. Currently, the original Navy system has been abandoned in place due in large part to its lack of serviceability while the ship is in the water. The current system is the over-the-side system which was in place when MARAD maintained the ship. We schedule monthly system inspections and annual dive inspections which prove the efficacy of the system and verifies the excellent condition of the hull after some 25+ years since last dry-docking.

   “We can provide readings/images of the hull as needed.

   “Sadly, there is a short but important list of ships which failed to utilize a suitable system during their early years of donation and are currently suffering for it.”
Cathodic Protection System Proposal Lightship Overfalls 2016

7720 Schmoldt Way
Celina, TX 75009

Date: December 6, 2016
Project: Lightship Overfalls
Location: 66 Sussex Drive
Lewes, DE

Lance Thomas
C-214-675-7222

Contact: David Bernheisel
Phone: 302-645-7377

Description - Request for Quote

2016 Cathodic Protection System Installation Quote

Installation of two (2) cathodic protection systems
One (1) Water Side system & One (1) Soil Side system

Impressed Current Cathodic Protection System for Water Side Includes
All design services, installation, materials & labor for sheet piling for Lightship Overfalls & Steel Sea Wall structure.

ICCP Cathodic Protection System for Soil Side Includes
All design services, installation, materials & labor for sheet piling.

Summary Report - as-built drawings, volt potential readings detailed installation report of all systems.

Fees include all expenses associated with this project listed above.
Excludes: Electrical contractor to hook up electrical power to rectifiers. To be provided by owner.

TOTAL

$60,200

Signed by

Lance Thomas

Date

12/6/2016