

Tank Talk[®]

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What You Need to Know about Tank Dive Evaluations

by: Jennifer Coon, CSP, CHMM, CET

Using divers to evaluate the interior surfaces of a water-storage tank has gained popularity, particularly when tanks cannot be drained for a thorough “dry” evaluation. Many reasons can prompt a dive evaluation such as system constraints, the tank owner’s wishes, or when a more thorough evaluation than can be obtained by using a remotely operated vehicle (ROV) to photograph the tank interior is needed. As the popularity of these “dive evaluations” has increased, so have the number of firms offering these services. But are all dive companies created equal? No, they aren’t. As a tank owner soliciting bids for dive evaluations, or an engineer coordinating the dive evaluations on your client’s behalf, you need to be aware of the do’s and don’ts of dive evaluations.

First of all – the interior of a full water-storage tank is a permit-required confined space, and prior to accessing any confined space, safety procedures must be clearly understood and meticulously followed. In addition to the OSHA confined space regulations, OSHA also regulates dive evaluations. Most tank owners are not aware of these regulations, and many dive companies, if they are aware of them, choose to ignore them. Performing tank evaluations in accordance with OSHA regulations is not the cheapest or the least labor-intensive option...but it is the only way to safely perform the evaluations. To meet and exceed these regulations, Tank Industry Consultants develops site-specific dive plans and emergency action plans prior to each dive. Divers Alert Network (DAN) is a resource for development of dive plans, and local emergency rescue

personnel are notified of these dives prior to the divers arrival on the site to help assure that in case of an accident, our dive personnel can receive prompt, proper medical treatment.

OSHA 29 CFR Part 1910, Subpart T – Commercial Diving Operations is the OSHA regulation that governs the dive evaluations within confined spaces. There are other industry standards, such as AWWA Standard 652 that can augment plans for dive evaluations, but 29 CFR Part 1910, Subpart T is the criteria by which dive evaluations should be safely conducted and by which fees, qualifications, or proposals for the dive inspection of water-storage tanks should be evaluated. Some of the key criteria include:

- Ensure that the company will comply with all OSHA regulations when diving your tank. (29 CFR Part 1910, Subpart T – Commercial Diving Operations is the specific OSHA regulation).



Diver Entering Water

Partnering with the US Navy: Water Storage Tank Maintenance on a Global Scale

by: Gregory R. "Chip" Stein, P.E., Managing Principal

Fourteen countries, 20 states, and 76 bases...that sounds like quite a deployment! But what if, instead, you are charged with the evaluation and maintenance of over 500 water-storage tanks and related structures on those bases. Who would you turn to for professional guidance? How would you keep all of the details of the structures' conditions and recommendations for maintenance organized in a manner that would allow you to rate and prioritize tank maintenance requirements?

The U.S Navy originally awarded Tank Industry Consultants an indefinite delivery/indefinite quantities contract for water storage tank engineering services worldwide in 2003. The contract has been renewed multiple times and is still in effect fifteen years later. Through the years, this partnership has grown and developed into an efficient program of monitoring and maintaining the Navy's global inventory of tanks at naval facilities worldwide.

This long-term partnership between TIC and the Navy is a textbook example of how a consistent approach to professional tank engineering and inspection benefits a tank owner with hundreds of tanks, or only a few. It is hard to measure the benefit to the Navy of knowing exactly how each tank evaluation will be conducted, and precisely what each report will tell them. Being able to compare multiple tank reports, knowing that each will contain precisely the same information, and basing the prioritization

of repair and repainting work on that information.

As you can imagine, a great deal of time and effort goes into mobilizing equipment and crews to some of the more remote bases. Circumstances change, and resolving issues "on the fly" becomes critical. The myriad of types of structures owned and operated by the Navy requires skilled professionals with many years' experience and expertise with all types and styles of structures. These same technicians use TIC's proven techniques for conducting thorough, detailed evaluations of the tanks providing all the information required for tank operation and maintenance.

Safe working practices are paramount when working around all the various types of equipment, buildings, and machinery maintained on each base. To fulfill the Navy's stringent safety requirements, TIC divers perform dive evaluations in accordance with the very latest dive regulations – both OSHA and Navy requirements. Technicians who access the bases undergo constant safety training updates and new procedures such as High-Angle Rescue. TIC's crew has the rope access qualification and specialized equipment needed to act as primary rescue in the event of an emergency.

Prior to the commencement of fieldwork, the Navy will be provided with site-specific HASPs and a certificate of third-party training with elements of tower climbing, self-rescue, rope access, and rescue with high angle for all climbing personnel.

To aid the Navy in tracking the condition of all of their tanks, TIC developed a Computerized Maintenance Management Prioritization System to track and prioritize tank maintenance. A computerized management tool for comparing the relative overall condition of tanks within the same water system simplifies long-term maintenance prioritization. The rating and maintenance prioritization system also includes provisions for estimating the cost of the forecasted maintenance schedule.

This critical component of this successful, long-term partnership with the US Navy can benefit all water tank owners. Tank management is much the same if you have five tanks within a few miles of each other, or hundreds of tanks scattered throughout the world. Lessons learned in this global partnership make ***TIC the world's foremost water storage tank engineers and inspectors.***



TIC Technicians undergo continual safety and emergency training to meet the Navy's stringent requirements.

Industry Standards and Guidelines

Each year, the Managing Principals, engineers, and TIC staff devote hundreds of hours to the development of the standards that advise water tank owners and operators on every aspect of tank management – from construction through demolition.



American Water Works Association

Steve Meier, P.E., S.E., TIC Managing Principal, has been appointed to a second three-year term on the **AWWA Standards Council**. The 24-member Standards Council oversees more than 65 Standards Committees that are responsible for over 180 Standards that AWWA publishes. These standards cover a wide variety of water industry topics including pipes, chemicals, storage tanks, valves, meters and other appurtenances.

Steve chairs the **AWWA Standards Committee on Steel and Composite Water Storage Tanks**, and Chip Stein, TIC's other Managing Principal, serves as Vice Chair. In their capacities, they oversee all standards development and revision processes for all steel and composite tank standards including D100 (design and construction), D102 (coatings), D103 (bolted tanks), D104 (cathodic protection), D106 (sacrificial anode cathodic protection systems), D107 (composite tanks), D108 (aluminum dome roofs), M42 (Tank Manual), and the proposed new stainless steel bolted tank standard.

The AWWA D101 standard for water tank inspections was last revised in 1953. The standard was reaffirmed without revision in 1986 and withdrawn by AWWA in December of 1998. In 2013, the AWWA Standards Council authorized the formation of a Revision Task Force to re-write D101 under the new title of the **AWWA Standard for Inspection of Water Tanks and Related Facilities**. Chip Stein, TIC's Managing Principal, chairs the D101 Committee, which is in the process of revising the standard.

In 1998, AWWA published the **Steel Water-Storage Tanks Manual M42**. The late Crone Kroy, TIC's founder, was the manual's technical editor, and Mr. Stein authored a chapter in the manual. The manual was designed to fill in some of the gaps left with the withdrawal of D101 and to build on its content. Mr. Stein revised the manual in 2012, and currently chairs the Revision Task Force that is updating the Manual.

In addition to his leadership role on these committees and task forces, Chip Stein is actively involved in several other crucial AWWA Tank Standards committees:

- Member, AWWA D102 Coating Steel Water-Storage Tanks Standard Committee
- Member, AWWA D104 Automatically Controlled, Impressed-Current Cathodic Protection for the Interior Submerged Surfaces of Steel Water Storage Tanks Standard Committee
- Member, AWWA D106 Sacrificial Anode Cathodic Protection Systems for the Interior Submerged Surfaces of Steel Water Tanks Standard Committees

In 2010, McGraw-Hill, in conjunction with AWWA, published the **Steel Water Storage Tanks handbook**. Steve Meier was the technical editor of this far-reaching commentary on steel water tank design, construction, maintenance, and repair. Mr. Stein and Jennifer Coon authored chapters for the handbook, including chapters on "Maintenance, Inspection, and Repair" and "Tank Rehabilitation."



National Fire Protection Association

While the American Water Works Association standards focus on potable water for human consumption, the National Fire Protection Association promulgates standards that focus on water storage tanks for fire protection. **Chip Stein** also serves as Principal Member, *NFPA 22: Standard for Water Tanks for Private Fire Protection* and *NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

It is easy to understand why no other tank engineering or inspection firm has better insight into current—and past—water tank inspection standards and guidelines.

TIC Welcomes Storage Tank Industry Veteran Leslie D. Scott, P.E.

Leslie D. Scott, P.E., one of the foremost tank engineers in the United States and a 37-year veteran of the storage tank industry, has joined Tank Industry Consultants as TIC's Chief Engineer, replacing John M. Lieb, P.E., who retired earlier this year. Leslie's work experience has included a wide variety of assignments encompassing numerous aspects of the field-erected and shop-built storage tank business including engineering, detailing, fabrication and construction processes, coatings, project management, inspection, and estimating functions. Leslie's experience includes projects conforming to AWWA, API,



ASME, NFPA, FM, UL, STI/SPFA and fire code standards. Leslie will operate from TIC's office in the San Luis Obispo, California area, and will assist TIC's clients with water storage tank design, evaluation, and rehabilitation projects. Leslie has been actively involved in numerous tank-related standards development committees/subcommittees of the American Water Works Association (AWWA) for over 30 years, working closely with TIC's Managing Principals, Steve Meier and Chip Stein on those committees. Leslie can be reached at 1-800-826-5736 or via email at Scott@TankIndustry.com.

Geography Quiz

Can you find which state TIC has not provided Water Tank Engineering and Inspection Services in?

(Hint: There aren't any!)

TIC has provided engineering and inspection services in all 50 states, D.C., Guam, Canada, Mexico, and 16 additional countries! Let us add your City or Town to our list of satisfied Tank Owners.



Dive Evaluations
Continued from Page 1

A recreational diving certification, such as PADI, is not an acceptable certification for diving tanks. You should ensure that your inspector has the correct certifications, i.e., a commercial diving certification. Requesting specific information from the inspector can help protect you from inexperienced and unprepared dive inspectors. Specific information to verify certification and competency of the inspector per the OSHA standard include:

- Valid Commercial Diving Certification from appropriate organization. The Association of Diving Contractors International (ADCI) and Diver Certification Board of Canada (DCBC) are the two most common in the United States.
- Company Field Records. This includes the company’s dive logs and the diver’s personal dive logs.
- Company Training Programs Completion Statements or Equivalent Proof of Competency.
- Safe Practices Manual.
- Continuous air monitoring for the tank interior conditions is performed to ensure that personnel will be safe in case of issues with equipment malfunction.
- OSHA regulations require that the tank systems be locked out and tagged out prior to a diver entering the water (29 CFR Part 1910, Subpart J – The Control of Hazardous Energy). This includes ensuring all valves are closed and any cathodic protection inside the tank is turned off.
- The dive team size will be a minimum of 4 personnel, each with a commercial diving certification. These dive teams are larger than a typical inspection crew due to safety concerns with diving in a permit-required confined space. The typical dive team will use SCUBA equipment as

it is more compact and Surface Supply diving is not practical for diving in elevated tanks. Either type of equipment will require that two divers be in the water and that two additional divers be on the roof, in the role of “tender” to assist each diver.

- Hire an experienced company. A diver experienced with tank diving will be much more prepared for the hazards

OSHA Office of Maritime Enforcement

#1 Contributing Factor to Diver Fatalities 2008—2013:

Insufficient Number of Dive Team Members

- 2008 to 2013 - 54 Diver Fatalities
- 24 Due to Insufficient Number of Dive Team Members

they encounter. Additionally, the diver should have relevant experience inspecting tank structures, appurtenances, and coatings. TIC excels in this area as we have been performing dive evaluations of water storage tanks for the past 20+ years. We have a breadth of knowledge as our dive team consists of multiple divers that are NACE Level 3 Certified Coating Inspectors.

- Ensure the divers and equipment will be disinfected and that the equipment has only ever been used in potable water. Some dive equipment cannot be disinfected properly if it has been used in other applications such as raw, untreated water. Ensuring this equipment is solely used for potable water helps protect you from contamination. TIC only uses our dive equipment in potable water. Additionally, all of our equipment that will be in contact with the water is disinfected in accordance with AWWA C652-11.

As an Owner, understanding the type of inspection you’re getting and its limitations is critical. Dive inspections can be limited by visibility and access. Divers are typically able to more carefully inspect the surfaces and appurtenances as compared to an ROV. This can help prevent costly change orders if rehabilitation specifications are written based on the evaluation. Some surfaces may not be accessible for close examination during a diving evaluation. Tanks do accumulate sediment over time and this sediment can greatly affect visibility underwater and significantly the visible surfaces below the sediment, such as the bowl or bottom plate. Due to safety risks, the interior of some appurtenances (such as wet risers) will not be evaluated. Divers are also restricted by time constraints that do not affect an ROV or drained evaluation. Divers must carefully monitor air consumption and time at depth, both of which vary based on the head range of the tank. The deeper the tank, the less bottom time a diver will have due to decompression, and the faster the diver will use their air supply. This can result in less time spent inspecting your tank’s interior surfaces. Tanks with a depth greater than 100 ft will require a decompression chamber on site, which would drastically increase the cost of the inspection.

Conclusion: Dive evaluations have proven to be an excellent means of evaluating the interiors of water-storage tanks. However, not all divers and/or dive evaluations are created equal. As a tank owner or engineer, it is your responsibility to verify that dive evaluations on your tanks are completed in a safe manner.

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- Sample RFQ/P for Soliciting Qualifications/Proposals for Dive Evaluations
- Complete Listing of Tank-Related Tank Committee Meetings at ACE2018
- TIC Statement of Qualifications for Water Storage Tank Engineering and Inspection Services

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