

TankTalk

Farewell to a Friend

On March 30th we laid to rest our founder, guide, mentor, and friend, Crone Knoy. Crone died in his home on Sunday March 26th after a six-month battle with cancer. He is survived by his wife, Cindy; sons Ed, Tim, and Bill; daughters Beth and Joan; and four grandchildren.

Crone was known throughout the United States for his engineering expertise in the storage tank industry. He donated countless hours to trade and standards-making organizations. He was a member of the Board of Trustees of Rose-Hulman Institute of Technology, his alma mater, where he continually worked to improve engineering education and to make it available for all that sought it. He and Cindy co-founded a local chapter of the Alliance of the Mentally Ill, a support group for the families and friends of the mentally ill.

The facts and figures of Crone's life and career are fascinating. But those of us who worked with him day in and day out respected and loved him for much more than his professional expertise and career accomplishments. We looked up to him—and not just because his 6 foot 5 inch height towered over us. He was a genuinely good man who endeavored to live up to the principals he embraced. He was a patient and unselfish teacher. He believed in our abilities and challenged us to dig down within ourselves to tap the unused aptitudes that he knew lay deep inside each of us.

Around Crone, we were allowed to be ourselves without fear of being ridiculed for our concerns and shortcomings. He and Cindy took a personal interest in each of us and our spouses and children. He was there for us when we needed someone to listen to our woes or to celebrate with us our children's great accomplishments. He somehow seemed to sense when we needed an encouraging word or one of his giant bear hugs. He cared.

We miss Crone. His deep voice that naturally projected throughout the office and announced his presence is no longer there. Walking down the hall we half expect to see him coming out of a nearby office or to hear the familiar page, "Crone's on line 3. Anybody need to talk to him?" As time



Ernest Crone Knoy, P.E.
May 19, 1936 – March 26, 2000

goes on, these flashbacks will no doubt lessen. But our wonderful memories of Crone and his magical ways will not. Our lives will be forever richer for having known him and worked beside him.

Crone's legacy will live on at Tank Industry Consultants and throughout our industry. For that we are truly grateful.

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President's Corner

By Steven P. Roetter, P.E., President, Tank Industry Consultants

Crone Knoy hired me 16 years ago and has been my mentor ever since. He gave me opportunities and challenges that allowed me to grow professionally and personally. I'll be forever in his debt for his teachings and friendship.

Crone didn't *micromanage*. He allowed us to figure things out for ourselves. On my first day at TIC, Crone took me into my new office and showed me a pile of papers on my desk. He said that he needed a proposal for a new tank project put together and wanted me to work on it. (At this point in TIC's development, a new tank project was HUGE.) After several minutes of explanation, Crone had a phone call he needed to take. I waited at my desk for a while for his return to finish telling me what to do. When Crone didn't come back, I went looking for him and found him at his desk. I asked if he had any further instructions and he said no, "when you get something put together, I'll look at it." So began my career at TIC...in much the same way many others at TIC started.

Vision for the Future - Crone was a man of vision. Some of you may remember that in recent issues of Tank Talk he outlined his plans for TIC's future. One popular Chairman's Corner article talked about hammering nails (keeping your eye on the immediate task and making modifications as needed) and planting corn (fixing your view on a point ahead in order to plant a crop that would be spaced with room to grow and flourish). He knew that Tank Industry Consultants was a living and viable entity. He wanted TIC to be able to stand on its own, even after he withdrew from the helm. To that end, he created an ESOP program to motivate and reward employees, as well as to provide a means of smooth transition when he chose to retire.

Crone began putting his plan into action about 10 years ago when he established a management team to gradually take over the day-to-day running of TIC. I was named President, and Chip Stein and Bill Daugherty

Vice Presidents. (Bill has since left the company to pursue other interests, and Steve Meier has joined the management team.) He then purchased a life insurance policy on himself with the corporation as the beneficiary. The proceeds of this policy were to be used to purchase the corporation from his estate upon his death.

With this first step in place Crone investigated various ownership transfer options and became sold on the idea of employee ownership. Four years ago, an Employee Stock Ownership Plan (ESOP) was established. Although initially no stock was contributed, Crone felt it was important to implement the plan even though we were not quite ready to put it into full force.

Three years ago, the ESOP borrowed money and purchased one-third of the company from Crone. This was a monumental day in Crone's life. He was as proud as I've ever seen him. The company that he started and devoted much of his life to was taking on a life of its own and would not be dependent on him.

Much to our regret, the final phase of Crone's ownership transfer plan was implemented with Crone's passing. The proceeds from the life insurance policy are being used to purchase the remaining stock from his wife, Cindy. This will make the TIC ESOP a 95% owner of the corporation, and the employees of TIC true owner/employees.

Crone's forethought and planning have left this organization in excellent financial condition, and his vision has stocked the organization with some of the most experienced and best trained talent in our industry. He invested heavily in *intellectual capital*. TIC has been, and will continue to be, a leader in industry research, standards making, and training.

The challenge and spirit that Crone willed to each employee/owner of TIC lives on. We humbly and gratefully accept his legacy and commit ourselves to keeping TIC strong and vital. That is exactly what Crone would want!

API RP 579 to Affect Tank Owners Nationwide

On January 20, 2000, the American Petroleum Institute released its Recommended Practice, *API RP 579 Fitness-for-Service*. API RP 579 prescribes rules and procedures for evaluating all types of storage tanks for fitness for service. The vast applications for this Recommended Practice and the potential advantages it represents to tank owners have not yet been fully realized, but it is anticipated that the new RP will have a significant effect on the storage industry.

John Lieb, TIC's Chief Industrial Engineer, attended API's first training course and is among the first to be certified to the procedures. The primary instructor for the inaugural course, David Osage, is the author of API RP 579. This course certification will enable TIC to offer its clients specialized training and knowledge in the application of API RP 579.

For more information about API RP 579, contact John at 630/226-0745 or lieb@tankindustry.com.

Tank Maintenance Seminar Schedule

Marriott DFW (TX) Airport
July 11 & 12

Irvine (CA) Marriott
July 31 & August 1

Radisson Sacramento (CA)
August 3 & 4

Cost for the two-day seminar
\$495

For more information or a registration form, please contact

Penni Snodgrass
1-800-TANKSEM
snodgrass@tankindustry.com

Planned Changes to AWWA D100-96

Commentary by Stephen W. Meier, P.E., S.E., Tank Industry Consultants, Acting Chair, AWWA Steel Tank Committee & Greg Larson, P.E., Pitt-Des Moines, Inc., Chair, AWWA D100 Task Force

AWWA D100 Standard for Welded Steel Tanks for Water Storage is the premier standard for the design of water storage tanks. The D100 Revision Task Force works continually to update and improve the standard. Mr. Greg Larson of Pitt-Des Moines, Inc. assumed the chairmanship of this Task Force upon Mr. Robert Wozniak's retirement in June 1999. The Task Force—and indeed the water storage tank stakeholders—are indebted to Bob for his many years of service to this group. Working closely with the Steel Tank Committee, Mr. Larson is leading the charge to revise the standard in many areas:

- ◆ Develop consistent guidelines for the seismic design of liquid storage tanks. The AWWA Standards Council approved a joint working effort between the AWWA Steel Tank Committee, the D100 Revision Task Force, and the API Subcommittee on Pressure Vessels and Tanks. This effort will integrate historic performance and design methods with current procedures contained in the IBC 2000 and proposed NEHRP 2000.
- ◆ Update the wind design requirements from the historically applied 100 mph wind pressures to conform to the wind design requirements of ASCE 7-98. These changes will adopt the ASCE 7 wind map, shape factors, and other variables. This change will also align AWWA D100 to be consistent with the new IBC 2000 Model Code.
- ◆ Incorporate design methods for water-filled cones, cylinders, and doubly curved shell elements that include the stabilizing benefit of internal pressure to increase the critical buckling loads. Similar procedures are being proposed for the new AWWA Standard on Composite Elevated Tanks for Water Storage.
- ◆ Revamp the weld qualification and inspection requirements for the field and shop.
- ◆ Evaluate allowing an increase in allowable foundation bearing pressure for wind design loading.
- ◆ Develop a new seismic method that bridges current design methods to those required for the probabilistic methods of IBC 2000.
- ◆ Develop a new seismic design method that addresses the very high ground acceleration often associated with a site-specific design and incorporate the deterministic methods of IBC 2000.
- ◆ Add guidelines for the installation of communications equipment and temporary construction openings in tanks.
- ◆ Add an Appendix that will be a commentary addressing specific issues such as seismic design, cellular antennas, and the use of heaters. In future editions, this may be expanded to cover overflow and venting design.
- ◆ Add factor of safety requirements for drilled and auger-cast deep foundations.
- ◆ Add a definition and requirements for the *critical zone* next to the base-to-shell intersection corner weld similar to API 653 requirements.

These and other changes designed to clarify or improve the application of the Standard will be discussed at the Revision Task Force meeting at the AWWA Annual Conference in June. Watch for a re-cap of AWWA Committee activities in future *Tank Talks*.

Chime Corrosion Cont.

What options are available if you've noticed symptoms of chime corrosion? The answer depends on how far the corrosion has advanced. Here are some very general guidelines:

- Corrosion in its early stage can be arrested by applying a flexible high-bond sealant to properly prepared surfaces. However, even the best sealants require periodic maintenance so this is not a job you can do once and forget about it.
- Corrosion that is already severe requires an inspection and assessment of the bottom plate thickness in and near the critical zone. API Standard 653 prescribes inspection methods and acceptance criteria that are applicable to water tanks as well as petroleum storage tanks. If the corrosion has not progressed beyond API 653 acceptance cri-

teria, properly selected and applied internal coatings or linings are often a cost-effective treatment option. If the corrosion has progressed beyond API 653 acceptance criteria, sometimes bottom patch plates must be installed or the entire outer annulus of bottom plates replaced.

- Corrosion that is not limited to the outer perimeter areas of the tank bottom, but rather extends to the interior portions will likely require complete bottom replacement or the installation of a new *double bottom*—a repair commonly used in petroleum tanks.

As with most tank issues, there is not necessarily a single best fix that can be applied to tanks that have experienced chime corrosion. It is important to properly engineer a long-term solution term once the problem is identified

SSPC 2000

November 12-16 – Nashville, TN

“Coating Underground Piping and Storage Facilities”

Tutorial Presented by
Tank Industry Consultants

Steve Roetter, P.E.

Chip Stein, P.E.

Ken Jacobi

For more information contact
SSPC: The Society of Protective Coatings
or visit their web site at
www.sspc.org

Temporary Construction Openings for Aboveground Storage Tanks

by John M. Lieb, P.E., Chief Engineer, Industrial & Paul A. Troemner, P.E., Project Engineer

The following is a brief excerpt from a technical paper Mr. John Lieb presented at the 2000 National Institute of Storage Tank Management Conference.

For a copy of the complete paper, please contact Tank Industry Consultants.

Aboveground steel storage tanks for the petroleum, chemical, and water industries are often constructed or rehabilitated with the aid of a temporary construction opening. This opening is commonly known as a *door sheet*. The door sheet is typically a large portion of or an entire plate of the first shell ring (and sometimes part of the second shell ring) that is cut out or, in the case of a new tank, is left out until construction is completed to allow access for construction equipment and materials into the tank. The size of the door sheet is typically dependent on the size of equipment that needs to pass through it.

Need to Exercise Caution

The cylindrical shell of a storage tank is a highly stressed membrane when the tank is in service. Cutting holes in it carries inherent risks. Although these risks can be managed by design with an understanding of tank behavior and proper attention to details, it is better not to disturb the shell at all, if possible.

An alternative to a temporary opening in the shell may be an opening in the roof. The roof of an atmospheric pressure storage tank is subject to only nominal stresses, and an opening of essentially any size can be provided with little or no additional stiffening necessary and no special fitting or welding procedures for replacement of the plate required.

In cases where the access opening needs to be relatively small or where equipment or materials can be designed to fit through smaller openings, existing flush-type cleanout fittings or large man-holes may be adequate to serve as temporary construction openings.

Critical Design/Construction Considerations?

Since the installation of a temporary

construction opening can potentially compromise the structural integrity or appearance of the tank, there are several critical design and construction issues to consider. These considerations include:

- materials and thickness of the shell plate
- location of the opening
- need for adequate stiffening of the opening
- procedure used for cutting the opening
- preparation of the plate edges to be welded
- weld procedures used to reinstall the door sheet
- intermediate and final inspection of the work

Inspection

Inspection should be performed during all processes involved in installing a door sheet. If inspection is only performed upon completion of the welding of the door sheet back into the shell there is a high risk of missing critical steps in the overall process, and ending up with a problem that is not easily corrected.

Engineering Specification

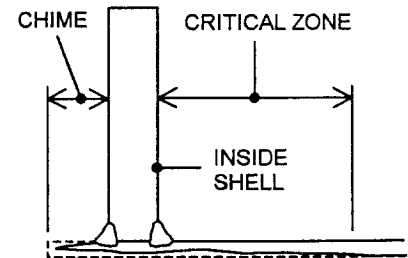
The installation of a temporary construction opening should not be treated as incidental to the work requiring the opening. Because of the important engineering considerations involved, the details should not be left up to the contractor. The engineering specifications for the work to be done should specifically address the door sheet installation.

Summary

AWWA D100, *Welded Steel Tanks for Water Storage*, API Standard 650 *Welded Steel Tanks for Oil Storage*, and API Standard 653 *Tank Inspection, Repair, Alteration, and Reconstruction* provide the necessary minimum information for evaluating temporary construction openings. However, these standards will not provide all of the details and engineering considerations necessary to ensure a proper temporary construction opening installation.

Tank Tip – Chime Corrosion

The bottom plate projection outside a tank is commonly referred to as the *chime*. Under adverse conditions, the chime can be subject to corrosion, and if not arrested or prevented, the corrosion can become severe. Severe corrosion can cause a leak in the bottom plate and/or the corner weld, and the product stored in the tank can be lost.



The area of the tank floor immediately inside the shell-to-bottom connection is very highly stressed and is vulnerable to corrosion in many petroleum and water services. API Standard 653 defines this *critical zone* as the width of the bottom plate inside of and within three inches from the shell, and restricts the types of repairs that may be performed in this area. It is therefore vitally important to the safety and integrity of your tank to take measures to prevent corrosion from progressing to a serious state.

Chime corrosion in its advanced state is typically characterized by progressive thinning of the outer perimeter of the bottom plate projection to a *knife edge* appearance. The exact profile depends on a number of factors, one of which is whether the corrosion mechanism is acting on the top side, the bottom side, or on both sides of the bottom plate. Corrosion of only the top side of the chime is a relatively rare occurrence. The most sinister form of chime corrosion is that which occurs on the bottom-side only. This form is more difficult for the untrained observer to detect and can progress to a very serious state before it is discovered. Generally, when the corrosion has progressed to the point that a knife edge has formed, the probability is high that there are dangerously thin areas of the bottom plate in or near the critical zone.

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