United States Environmental Protection Agency

Underground Storage Tank Technical Compendium References:

New/Upgraded UST Systems

U.S. EPA Office of Underground Storage Tanks

The compendium contains interpretations and guidance letters sent out by the Office of Underground Storage Tanks. These references are cited within the underground storage tanks technical compendium at http://www2.epa.gov/ust/underground-storage-tank-technical-compendium.

Contents

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

APR 6 1989

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Mr. Mike Nolan
Executive Vice President
Total Containment, Inc.
15 East Uwchlan
Exton, PA 19341

Dear Mr. Nolan:

This is in response to your communications with Dave O'Brien and Tom Schruben of my staff about your company's Total Containment Tank. You asked if this tank meets with EPA's final performance standards for new underground storage tanks provided in 40 CFR Part 280.20. It does.

This relatively new type of tank system uses a U.L. 58 steel tank shell and is surrounded by a secondary containment jacket that last fall passed the tests required by the Underwater Laboratories, Inc. These tests investigated the compatibility of the jacket material with petroleum products, alcohols, and alcohol-gasoline mixtures; other physical properties of the tank's construction materials' and the corrosion protection properties of the jacket system in protecting the steel tank shell from external corrosion in accordance with U.L. 1746. The documentation you provided from U.L., and our own calls to their offices, assure us that the Total Containment Tank is authorized to use the listing mark of Underwriters Laboratories, Inc. and is now eligible for U.L. follow-up inspection service.

Based on the above U.L. test results and our examination of the system's detailed specifications that you provided, we consider the system to meet the final performance standards for new tanks as provided for in section 280.20(a)(5).

Sincerely,

James McCormick, Director
Policy and Standards Division
Office of Underground Storage Tanks

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 1 1990

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Review of Total Containment's "Enviroflex" Piping

FROM: Dave O'Brien, Chief
Standards Branch

TO: Lee Daniels
UST/LUST Program Coordinator
Region VII

This responds to your July 13, 1990 request for a review of the Total Containment's "Enviro Flex" piping technical submittal to Region VII in order to determine if their piping system is no less protective of human health and environment than the other piping methods allowed under Section 280.20(b)(l)-(3). A positive determination in this matter by the implementing Agency (in this case EPA) would assure users of the "enviro flex" product that they are in compliance with the requirements for new piping under Section 280.20(b)(4).

It is our determination that. the enviroflex prototype's design and construction meets the intent of the requirements for new piping in section 280.20(b). Based on the information provided by Total Containment to you, we have concluded that the enviroflex piping system is no less protective than the other methods allowed under Section 280.20(b)(l)-(3) for the reasons provided below.

First, as stated in the preamble to the final rule, it remains EPA's intent to avoid interfering whenever possible with the ongoing development of innovative and more environmentally protective new technologies (See 53 FR p37095, September 23 1988). Clearly, Total Containment's flexible piping/secondary containment system is innovative and intended to be environmentally protective. The Company's attempts to first install several Closely-monitored test/prototype sites nationwide we believe warrants special consideration by EPA.

Second, we have evaluated the technical information against our knowledge of the three most common failure modes of piping in the past and recognize that Total Containment has already tried to address them. The primary containment piping's materials of construction, plus the fact that it is all placed within a secondary containment jacket, should eliminate the threat of releases due to external corrosion. The flexible nature of the piping should address the types of piping failures that are due to accidents, frost heaves, and other stress-causing underground movements. Finally, we also noted the draft installation procedures provided, and the company's stated commitment to use ANSI/NFPA 30A, PEI/RP100, API 1615 as guidelines so the installation-caused releases are kept to a minimum. Each of the above features are aimed at the three major causes of release from piping we have witnessed to date.

The extensive nature of the static and dynamic testing already done by Dayco with reference to numerous existing standards (such as UL330 NFPA30, ANSI B31.3 and B31.4) demonstrate proper concern with the primary containment piping's design. Total Containment's submittal to U.L. for listing and the scheduling of other independent test lab work is appropriate and reassuring.

And finally, the fact that Total Containment also admits these installations are prototypes, will be continuously and automatically monitored, as well as having all the sumps inspected monthly, have caused us to conclude that this piping system is no less protective of human health and the environment than the other methods allowed under 28O.20(b)(1)-(3). However, please note that we may need to reconsider this determination in the future should Total Containment fails to get UL listing in a timely manner, does not pass their independent lab tests, or experiences operational problems with the integrity of the piping system that are detected through their continuous monitoring of the prototype systems,

If you want to discuss this matter further let me know. However, if you agree, when you discuss it with Total Containment, please remind them to check with State and local officials where they want to use the enviroflex system. As you know, they have to also satisfy those other governments' requirements which may be different or more stringent the EPA’s.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

SEP 4 1990

Andrew Bowey
Technical Representative
Total Containment
306 Commerce Drive
Exton, Pennsylvania 19341

Dear Mr. Bowey:

The Office of Underground Storage Tanks has reviewed Total Containmant's "Enviroflex". piping and has determined, for the interim, that it meets the requirements for piping in 40 CFR. 280.20(b)(4) if certain conditions are met. Enclosed is a copy of that determination.

As stated, this determination is not final. It will be reconsidered by EPA if Total Containment fails to obtain a listing from the Underwriters Laboratories (UL) Inc. in a timely manner (one year), does not pass independent laboratory tests, or experiences operational problems with the integrity of the piping system at the facilities where it is currently installed. If any of these occur, owners who have installed this piping will be required to remove it. Please keep me informed on each of the above items.

Until a final determination by EPA is made, use of this piping will require that Total Containment fulfill the following special conditions for each facility where "Enviroflex" piping is used:

1. Piping will be continuously and automatically monitored,

2. All sumps will be inspected monthly,

3. Installation procedures will adhere to the requirements in ANSI/NFPA 30A, PEI/PRlOO, and API 1615, and

4. Records documenting compliance with these conditions will be kept on site.

Please send me a written response that Total Containment will adhere to these conditions. Of course, owners must meet all the regulatory requirements for underground storage tank systems.

During our telephone conversations you mentioned that some facilities in EPA, Region VII (Nebraska, Iowa, Kansas, and Missouri) are using "Enviroflex" piping. For each location, please provide the company's name, address, name of the person to Contact and their telephone number and the facility's name, address, person to contact and their telephone number.

Finally, please remember that owners must also comply with the requirements of the state and local agencies. They may be different or more stringent than EPA's.

If you would like to discuss this or have questions, please call me at (913.) 551-7651.

Sincere1y,

Lee Daniels
UST/LUST Program Coordinator

Enclosure

cc: Dave O'Brien, OUST
Clark Conklin, NSFM
Keith Bridson, IDNR
Gary Blackburn, KDHE
Gordon Ackley, MDNR
RPM's Region 1 - 10

Minnesota Pollution Control Agency

May 6, 1993

Mr. Gerald Phillips
Office of Underground Storage Tanks
U.S. Environmental Protection Agency
Region V (HRU-8J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Dear Mr. Phillips:

RE: New PP4 test Station for Testing cathodic Protection on Steel Tanks and Piping

At issue is Federal Rule 40 CFR 280.31(b), Qualifications for Corrosion personnel, which states that a qualified corrosion protection tester who can demonstrate education and experience in the measurement of cathodic protection of buried or submerged piping and metal tanks must be used to test the cathodic protection on buried metal tanks and piping.

Effective February 4, 1993, the Steel Tank Institute (STI) requires that all sti-P3 tank systems be equipped with the new PP4 test station which has a permanently installed reference cell buried beneath the tank and a permanently mounted test station.

The PP4 test station was developed for STI by William P. Carlson and James B. Bushman of Corrpro Companies, Inc., Medina, Ohio. Of relevance here is Environmental Protection Agency's (EPA) earlier determination that a corrosion expert need not be used to design or install a field-designed corrosion protection~system for piping if the applicable part of the guidance document PEI RP-100 is followed because the document was written by a corrosion expert. (Refer to enclosure entitled, “Questions and Answers”).

A logical corollary to this EPA ruling would be a determination that owners/operators of steel underground storage tank (UST) systems be required to monitor the cathodic protection on these systems if they are equipped with a PP4 system because it was designed by corrosion experts.

An optional testing device for the PP4 test system is available which allows the tank owner to test his own tank and piping for cathodic protection. Detailed instructions are included with the testing device which is a simple voltmeter which gives a qualitative pass-fail response.

Since the test is simple to perform, it is the position of the Minnesota Pollution Control Agency (MPCA) that the Federal Rule should be interpreted to allow the owner/operator or his designee to test the tank and piping for cathodic protection.

For purposes of comparison, I wish to point out that most release detection monitoring is done by the owner/operator without the requirement that they retain the services of an expert to do this for them. The MPCA believes that the Federal UST rule is set up as a self-monitoring program and in keeping with this, owners/operators should be allowed to do their own corrosion protection monitoring if their UST systems are equipped with PP4 test stations.

Since STI requires that all STI-P3 tank systems manufactured since February 4, 1993, be equipped with the permanent PP4 test system and since it is being promoted as a test-it-yourself system, an expedited ruling on this matter would be greatly appreciated.

Sincerely,

/S/

Beth G.. Lockwood, Supervisor
Compliance and Assistance Unit
Tanks and Spill Section
Hazardous Waste Division

BGL: vb

cc: First Lieutenant Arthur R. Nash, Jr., Region V - Michigan
Ms. Deloras Sieja, EPA Region V
Mr. James McCaslin, Region V - Illinois
Mr. John Gunter, Region V - Indiana
Mr. Mike Williams, Region V - Ohio
Mr. William J. Morrissey, Region V - Wisconsin

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

October 27, 1993

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: STI PP4 Test Station for Cathodic Protection Monitoring

FROM: David Ziegele, Director */s/*
Office of Underground Storage Tanks

TO: Gerry Phillips, Chief
Region 5 Office of Underground Storage Tanks

In a May 6, 1993, letter to you (copy attached), Beth Lockwood of the Minnesota Pollution Control Agency (MPCA) asked that an interpretation be given for a corrosion control testing device that is permanently installed during placement of a STI-p3 tank. Her question, paraphrased, asks:

“Can an owner/operator test his own cathodic protection system using the Steel Tank Institute's "PP4" cathodic protection testing apparatus?”

The answer is yes, an owner/operator can test his cathodic protection system using the "PP4" tank testing apparatus. The following discussion explains why.

The Steel Tank Institute's STI-P3 tank is a tank system that includes a cathodic protection system that was pre-engineered and designed by a corrosion expert. The installation of the corrosion protection aspects of this tank system do not require further cathodic protection design considerations because the cathodic protection system was designed and packaged by a corrosion expert. Installation of the tank system must be performed by qualified installation personnel.

Similarly, the "PP4" test system and test measurement device were designed and developed by corrosion experts to provide the owner/operator with a means to check and verify that the cathodic protection system is operating properly. The use of the “PP4" system meets the requirements given in § 280.31[b] All UST systems with cathodic protection systems must be inspected for proper operation by a qualified cathodic protection tester in accordance with the following requirements.... The simplicity and ease of use of this device allow test measurements to be taken easily and readily interpreted by the owner/operator without extensive knowledge about the dynamics of corrosion or corrosion protection.

The owner/operator still will have to meet the requirements given in § 280.31 Operation and Maintenance or Corrosion Protection, particularly related to the test frequency and record keeping requirements. Also the owner/operator must be able to demonstrate to an inspector the operation of the PP4 system.

I hope this interpretation answers MPCA's question. Please contact Randy Nelson (703-308-8565) or David Wiley (703-308-8877) if you have any questions or need additional information.

Attachment

cc: UST/LUST Regional Program Managers
UST/LUST Regional Branch Chiefs
UST/LUST Regional Attorneys
Dawn Messier, OGC
Milton Robinson, OE
OUST Management Team

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 8 1994

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Mr. John D. Barnes
Manager, Government and Public Affairs
Steel Tank Institute
570 Oakwood Road
Lake Zurich, IL 60047

Dear Mr. Barnes:

In late April 1994, the Steel Tank Institute (STI) notified the Environmental Protection Agency (EPA) of its desire to withdraw its request for EPA to relax the mandated frequency for monitoring the cathodic protection of federally regulated sti-P3® underground storage tanks (USTs). By return letter the Agency honored STI's request. The purpose of this letter is to respond to your letter of May 12, 1994 to Administrator Browner (copy enclosed) by which STI notified EPA of its desire to continue to seek relaxation of the federal requirement for monitoring cathodic protection systems on sti-P3® USTs. This letter also provides information on the Federal Register Notice of Data Availability, which solicited public comments on this issue and on the Tillinghast study. Enclosed are copies of the Federal Register notice and EPA's Comment-Response document.

Your May 12th letter states "The Notice of Data Availability (NDA) process was suggested to STI by the EPA Office of Underground Storage Tanks (OUST) as a way to accomplish the amendment of the monitoring mandate...." This statement is misleading. In response to STI's request for relaxation of the monitoring requirement, EPA voluntarily chose to publish a NDA as a mechanism to obtain public comment and a broader perspective on the technical issue under consideration, and as one of several sources of information to be used in the Agency's deliberative process. At no time was there a presumption that publishing the NDA would mean that the Agency intended to relax the requirement or that it was a necessary precondition to making such a change should the Agency decide to do so.

We have carefully reviewed STI's arguments, the Tillinghast study and all other information submitted to the docket as of the end of January, 1994. The Agency has decided not to take any action at this time to relax the frequency requirement for cathodic protection monitoring of sti-P3® tanks.

BACKGROUND

In 1992, STI and its members requested that EPA relax the frequency requirement for ongoing cathodic protection monitoring of certain regulated USTs. This requirement, found at 40 CFR 280.31(b)(1), requires that "all cathodic protection systems must be tested within 6 months of installation and at least every 3 years thereafter or according to another reasonable time frame established by the implementing agency...." STI requested that EPA, as an implementing agency, alter the required frequency for sti-P3® tanks to be at the time of installation and subsequently only after any disturbance of the excavation into which the tank had been placed. EPA indicated that it did not have data sufficient to support relaxing the requirement at that time.

STI then contracted with Tillinghast, a Towers Perrin Company, to perform a study of the issue and provide a report of the findings. EPA, after informing STI of its intentions to do so, made the report, titled "Evaluation Of The Potential For External Corrosion And Review Of Cathodic Protection Monitoring Associated With sti-P3® Underground Storage Tanks," available to the public. Although not required to, on October 25, 1993, EPA published a Notice of Data Availability in the Federal Register and requested public comments on the report. The comment summaries and EPA's responses provided in the enclosed document.

DISCUSSION

STI and its members asserted that the required frequency for cathodic protection monitoring of sti-P3® tanks should be relaxed for the following reasons:

- sti-P3®'s excellent performance record;
- Cathodic protection monitoring duplicates the effort of the required monthly leak detection checks;
- Regulatory inequity between existing steel tanks without corrosion protection, which are not subject to the requirement, and sti-P3® tanks;
- Periodic deflection monitoring for fiberglass-reinforced plastic (FRP) tanks is not required;

- o Tendency for the monitoring requirement to affect UST buyers' choices;
- o Industry's high cost of compliance; and
- o Lack of regulatory enforcement efforts directed at cathodic protection and its monitoring.

EPA's responses are summarized below. For additional discussion, see the enclosed Comment-Response document.

sti-P3®'s performance record

The information provided to EPA from STI and other sources shows that, to date, sti-P3® tanks appear to have a very good record of not failing due to external corrosion. However, there are several reasons why the data presented by STI are not compelling enough to warrant relaxation of the monitoring requirement at this time. The first is the youth of the installed sti-P3® tanks relative to their expected service life. No sti-P3® tank has been in the ground for a period of time equal to the current 30-year warranty period. The vast majority of the more than 200,000 sti-P3® tanks installed are less than nine years old. Though the Tillinghast report provided some information on older tanks (registered 1970-75), the information in the report is largely from the more common younger tanks. Indeed, compelling data may not exist at this time, due to the relative youth of the sti-P3® population. Secondly, and importantly, cathodic protection monitoring data show that eight percent or more of tanks tested cannot be shown with certainty to meet the industry standard for cathodic protection. This does not mean that these tanks are corroding, but it does mean that, for whatever reason, there is not certainty that they are not. Finally, as the Tillinghast report and many commenters pointed out, problems with sti-P3® tanks due to external corrosion have been documented.

Cathodic protection monitoring and the required monthly leak detection checks

The cathodic protection monitoring requirement, while it shares some similarities with the leak detection monitoring requirements, serves a fundamentally different purpose, and therefore does not duplicate the leak detection effort. Cathodic protection systems and the requirements for monitoring them are designed to reduce the likelihood that any release from an UST will occur and is, therefore, a method of pollution prevention. Leak detection monitoring helps reduce the chances that a leak will become significant, but in general is not designed to reduce the likelihood of a leak.

Regulatory requirements for existing steel tanks without corrosion protection and for cathodically protected USTs

While it is true that the UST regulations do not require monitoring of existing steel tanks without corrosion protection ("bare steel tanks") and that they can continue in service until 1998, this does not warrant relaxation of the requirements for cathodically protected steel tanks. EPA still believes, as it did when the final technical rule was promulgated in 1988, that even though bare steel tanks pose a significant environmental threat, a compliance period of less than 10 years for replacing or upgrading these tanks was not feasible due to the large universe of unprotected tanks. The same considerations did not, and still do not, apply to cathodically protected tanks. No one contends that there are not enough testers available to meet the required frequency, and as discussed below, once a tank is cathodically protected, complying with the monitoring requirements does not pose an undue burden on the regulated community. Meanwhile, it is important for cathodically protected tanks to be monitored, to ensure that they are indeed protected, and to ensure that they do not add to the threat already posed by existing bare steel tanks. EPA also would like to note that any apparent inequity caused by the monitoring requirement is diminished by the fact that bare steel tanks must be replaced, upgraded, or closed by 1998, at significant expense to the owner or operator, while sti-P3® tanks (with spill and overfill equipment) need not be.

Deflection monitoring for fiberglass-reinforced plastic (FRP) tanks

While it is true that FRP tanks are not subject to ongoing tank wall deflection monitoring to ensure protection against structural failure, the Agency believes that this is not a valid reason to eliminate or reduce the cathodic protection monitoring requirement for sti-P3® tanks. Tank wall deflection in FRP tanks is a fundamentally different physical phenomenon from external corrosion of steel tanks. Because each tank technology is different, EPA imposed technical standards which require testing methods and frequencies specific to the technology used. Therefore, such comparisons are not persuasive.

The monitoring requirement and UST buyers' choices

In response to concerns that the cathodic protection monitoring requirement affects buyers' choices, this influence may occur, but EPA believes it is only one of several factors that have led to changes in the market shares for various tank technologies over the past few years. EPA believes that all the technologies allowed in the final technical rule (40 CFR 280.20), when operated in accordance with EPA regulations, are protective of human health and the environment. As for cathodically protected steel tanks, STI's proposal implicitly recognizes (i.e., by supporting monitoring when conditions suggest that the system may be compromised), that the sti-P3® tank is fully protective only if the cathodic protection system is operating properly. For the reasons set out in this letter and the Comment-Response document, EPA believes that monitoring every three years is a reasonable, and not particularly burdensome, way to ensure that the system is fully protective. In addition, monitoring can be viewed as a benefit to potential customers, because it ensures that an owner's equipment is performing as it should.

Industry's cost of compliance

As stated in the preamble to the final UST technical rules, EPA recognizes that the UST community in large part is composed of small businesses with limited resources and that, wherever possible, EPA's rules should accommodate this fact. See 53 Fed. Reg. 37084 (Sept. 23, 1988). The Agency believes that the present monitoring requirement does not contravene this operating principle, because the information before EPA demonstrates that cathodic protection monitoring is easy to perform and inexpensive relative to other costs of operating USTs, and especially relative to costs of pollution remediation. Regarding ease of use, problems commonly reported with monitoring often can be rectified by relatively simple means. Regarding costs, the information EPA received shows that cathodic protection monitoring costs generally range from $95 up to a few hundred dollars for a typical location with three tanks. This cost, incurred every three years, is insignificant relative to many other expenses involved in installing and operating USTs. In addition, monitoring is very inexpensive in terms of both time and money relative to the costs of cleaning up a leak. EPA believes that the effort and costs of monitoring are reasonable, do not pose an unnecessary burden, and may save owners and operators from significant expenses in the long run.

Regulatory enforcement efforts directed at cathodic protection and its monitoring

Enforcement priorities for UST systems may differ state by state. However, the extent of current enforcement activity does not determine the need for cathodic protection monitoring. In many states, enforcement of the leak detection requirements has priority over the cathodic protection monitoring requirements, partly because of the earlier deadlines for all tanks to be in compliance with the leak detection requirements. However, with the upcoming 1998 compliance deadline for corrosion protection of all regulated USTs, the emphasis likely will shift to include more vigorous enforcement of the cathodic protection monitoring requirements. EPA believes that cathodic protection monitoring is an important component of pollution prevention for USTs.

CONCLUSION

In addition to the fact that the Agency is unpersuaded by STI's arguments addressed above, it is important to note that STI seeks a relaxation of the monitoring frequency despite the fact that the Tillinghast report was not able to come to any conclusion regarding an appropriate frequency. STI's position that post-installation monitoring should be limited to instances of disturbance of the excavation, without supporting data and/or analyses, is unpersuasive. This is because site conditions which can affect the performance of the anodes can occur or change without the owner or operator's knowledge (e.g., stray currents that may overpower anodes). Therefore, absent data that would alleviate this concern, the Agency cannot say that STI's proposed frequency would be, as EPA determined in promulgating the current 3-year monitoring frequency, "sufficient to detect any damage or failure of the system and to take remedial action in time to prevent structural failures due to corrosion" (see, 53 FR 37137).

Furthermore, EPA's decision not to relax the cathodic protection monitoring requirement also is strongly supported by the fact that several national standards, from both industry and government, place stricter requirements on cathodic protection monitoring than do EPA's UST regulations. Please see the enclosed table comparing several national standards' cathodic protection monitoring requirements.

In short, EPA believes that the information before it is not compelling enough to warrant relaxation of the cathodic protection monitoring requirement at this time. EPA continues to believe that steel tanks, protected from corrosion according to both industry standards and Agency regulations, remain protective of human health and the environment. The fact that cathodic protection monitoring of sti-P3® tanks is possible and required means that owners and operators are likely to make sure that the environment - and their investment - remains protected.

A copy of this letter and of EPA's Comment-Response document will be sent to all those who have expressed interest in this issue, including those who submitted written comments.

Sincerely yours,

David W. Ziegele, Director
Office of Underground Storage Tanks

Enclosures:
1. May 12, 1994 letter from John Barnes, STI
2. Federal Register Notice of Data Availability
3. EPA Comment-Response document
4. Table of Standards for Cathodic Protection Monitoring

cc: State UST Program Managers (without Encl. 3)
UST/LUST Regional Program Managers
UST/LUST Regional Branch Chiefs (without Encl. 2 and 3)
Dawn Messier, OGC
Susan O'Keefe, OECA/RCRA
OUST Management Team (without enclosures)

STIRepl6.W51

E N V I R O N M E N T A L   P R O T E C T I O N   A G E N C Y

40 CFR Part 280

Evaluation of the Potential for External Corrosion and Review of Cathodic Protection Monitoring Associated with sti-P3 Underground Storage Tanks: Notice of Data Availability

AGENCY: Environmental Protection Agency.

ACTION: Notice of Data Availability.

SUMMARY: The Environmental Protection Agency (EPA) is today publishing a notice of data availability regarding a report completed by Tillinghast, a Towers Perrin Company, on behalf of the Steel Tank Institute (STI). The Tillinghast report examines the potential for external corrosion of sti-P3 underground storage tanks (USTs) as well as owners' and operators' corrosion monitoring practices for USTs. The Agency's current regulations for corrosion monitoring require periodic post-installation monitoring of cathodically protected steel underground storage tanks. The Steel Tank Institute approached EPA in 1992, requesting it alter the mandated monitoring frequency for cathodic protection monitoring of steel USTs, and specifically, USTs manufactured by STI members under the "sti-P3" specification. EPA responded by agreeing to

consider data supplied by an independent, third-party examination of STI's initial findings, as part of an overall data collection process. This notice summarizes the methodology, findings, and conclusions of the study. EPA encourages public review and comment on the Tillinghast report, as it may be used in arriving at a final determination regarding STI's request for EPA to modify the current requirements for cathodic protection monitoring for steel underground storage tanks.

DATES: Written comments on this notice must be submitted on or before [insert date 60 days after publication in the Federal Register].

ADDRESSES: Written comments on today's supplemental notice should be addressed to the docket clerk at the following address: U.S. Environmental Protection Agency, RCRA Docket (OS-305), 401 M Street, S.W., Washington, DC 20460. One original and two copies of comments should be sent and identified by regulatory docket reference number XX-XXXXX. The docket is open from 9:00 a.m. to 4:00 p.m., Monday through Friday, excluding Federal holidays. Docket materials may be reviewed by appointment by calling (202) 260-9327. Copies of docket materials may be made at no cost, with a maximum of 100 pages of material from any one regulatory docket. Additional copies are $0.15 per page. For a copy of the Tillinghast report, contact the EPA RCRA Docket.

FOR FURTHER INFORMATION CONTACT: For general information about this supplemental notice, contact the RCRA/Superfund/OUST Hotline, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency Washington, DC 20460, (800) 424-9346 (toll-free) or (703) 412-9810 (local). For the hearing impaired, the number is (800) 553-7672 (toll-free).

SUPPLEMENTARY INFORMATION:

I. Background

A. Technical Requirements for Underground Storage Tanks

Final regulations for Underground Storage Tanks (USTs) containing regulated substances were promulgated by the Agency in September and October, 1988 and became effective in December, 1988 and January, 1989. The regulations include technical requirements for new and existing underground storage tanks and piping, financial responsibility requirements for UST owners and operators, and state program approval requirements. In order to prevent releases, EPA included in the technical requirements four important categories of preventative measures: (1) tank design and installation, (2) release detection, (3) corrosion protection, and (4) spill and overfill control. All UST systems installed after December 22, 1988 must meet Federal requirements immediately. Owners of tank systems installed on or before that date have until December 22, 1998 to either upgrade their tanks with corrosion protection and spill and overfill devices, replace them with new tank systems, or close them in accordance with the regulatory requirements.

According to a study conducted for EPA in 1987, corrosion of tanks and piping was a major cause of UST system releases. At that time, most installed USTs and piping were constructed of "bare steel" -- steel without corrosion protection. When buried in the ground, steel without corrosion protection can be destroyed by external corrosion, resulting in leaks. One type of corrosion protection is cathodic protection, which is a technique to prevent corrosion of a surface by making that surface the cathode of an electrochemical cell. For UST systems, this can be done by applying either galvanic anodes or impressed electric current.

The UST regulations include requirements for the operation and maintenance of corrosion protection of steel UST systems. As part of these requirements, owners and operators of steel UST systems equipped with cathodic protection must ensure that all cathodic protection systems are tested within 6 months of installation and at least every 3 years thereafter, or according to another reasonable time frame established by the implementing agency. *See* 40 CFR 280.31(b)(1). The Preamble to the rule noted that, "After consultation with groups of industry experts during the public comment period, EPA now agrees with the commenters who recommended that all cathodic protection systems should be tested at the same frequency and the Agency is now requiring in the final rule that all cathodic protection systems be tested within 6 months of installation and at least every 3 years thereafter. These intervals are sufficient to detect any damage or failure of the system and to take remedial action in time to prevent structural failures due to corrosion. EPA understands that this time interval is consistent with sound practice as is now recommended in the recently revised NACE [(National Association of Corrosion Engineers)] code and by major tank manufacturers." See 53 **Fed. Reg.** 37137.

B. Steel Tank Institute Request and Study Report

The Steel Tank Institute (STI) is a trade organization comprised of steel tank manufacturers. STI members manufacture pre-engineered underground storage tanks built to the "sti-P3" specification, for storage of liquids at atmospheric pressure. Tanks meeting the sti-P3 specification employ three types of corrosion protection: (1) dielectric coating, (2) electrical isolation, and (3) cathodic protection through factory-installed anodes. More than 200,000 sti-P3 tanks have been fabricated and placed in use since 1969, the vast majority since 1985, and they are commonly installed today.

Single-wall sti-P3 tanks in service for storage of Federally regulated substances are covered by the cathodic protection monitoring requirements outlined above. Those tank owners who installed sti-P3 tanks in Federally regulated service between late 1988 and February of 1993 were eligible to enroll in STI's "Watchdog" cathodic protection monitoring service. The Watchdog service, performed through STI, provides cathodic protection monitoring in compliance with the EPA requirements. Since February of 1993, a simplified, user-friendly cathodic protection monitoring test system with a buried reference cell is installed with new sti-P3 tanks subject to Federal UST regulations. Those sti-P3 systems installed prior to 1988 have been operated without cathodic protection monitoring in most cases.

In the spring of 1992, STI requested that EPA alter the frequency of cathodic protection monitoring from the current requirements, to monitoring within 6 months of installation and subsequently only after any disturbance of the excavation (e.g., retrofit of Stage II vapor recovery systems). Periodic monitoring would therefore not be required. STI provided data on the performance of sti-P3 tanks and on potential costs for cathodic protection monitoring of sti-P3 tanks in support of its request.

STI and its members believe that the mandated frequency for cathodic protection monitoring should be changed for the following reasons:

* The sti-P3 tank has a very good performance record;

* The much more frequent monthly leak detection checks required by the UST regulations supersede the need for cathodic protection monitoring;

* There is inequity in that thousands of existing steel tanks without corrosion protection, which are much more likely to fail before phase-out in 1998, are not subject to the cathodic protection monitoring requirement;

* Periodic tank deflection monitoring for fiberglass-reinforced plastic (FRP) tanks was not required in EPA's UST regulations due to the low incidence of failure in FRP tanks (less than 0.5 percent), and sti-P3 tanks have similarly low failure rates;

* UST buyers consider cathodic protection monitoring and the associated recordkeeping required with steel tanks to be an inconvenience, and this affects buyers' choices among UST technologies;

* There is a high cost of compliance to industry; and

* Regulatory enforcement efforts are directed at clean-ups and leak detection, not cathodic protection -- an indicator that monitoring cathodic protection is not an essential activity

towards protecting human health and the environment.

The Agency took no regulatory action in response to STI's request and the supporting information. STI asked Tillinghast, an international risk management and actuarial consulting firm with experience in underground storage issues, to conduct an independent, third-party audit of STI's data. In May of 1993, STI provided the Agency with a report prepared by Tillinghast titled "Evaluation Of The Potential For External Corrosion And Review Of Cathodic Protection Monitoring Associated With sti-P3 Underground Storage Tanks." An abstract of the report follows.

The pollution prevention components of the UST regulations (including corrosion protection) are very important to the UST program. Therefore, the Agency has decided to publish this Notice of Data Availability and solicit public comment on the report to ensure a more complete understanding of the issue at hand. This Notice includes several questions to help guide public discussion. The Agency is interested in responses to any of the questions listed below, and other issues the public may identify, such as the costs/benefits of the monitoring requirement itself.

II. Abstract

In May 1993, Tillinghast completed a study on behalf of the Steel Tank Institute (STI) which surveyed tank owners, tank installers, and regulators to identify any instances of failures of sti-P3 tanks attributed to external corrosion and to obtain experience information on cathodic protection monitoring practices. A summary of Tillinghast's methodology, findings, and conclusions follows.

Methodology

Tillinghast telephone-surveyed randomly selected sti-P3 underground storage tank (UST) owners and tank installers as well as Federal and State UST regulators about the condition and general maintenance of sti-P3 tanks. These individuals, along with data from the STI Watchdog program (a corrosion monitoring program initiated by STI in 1988 to assist tank owners in complying with EPA corrosion monitoring requirements) provided information on the frequency, conditions, and other aspects of the cathodic protection monitoring practices for sti-P3 tanks. In addition, the survey sought performance history on sti-P3 tanks which were not subject to cathodic protection testing. Tillinghast also examined environmental impairment, warranty, and product liability insurance claims from the Steel Tank Insurance Company (STICO, a captive insurance company formed by steel tank manufacturers).

Tillinghast selected a sample of owners and installers through STI's computer data base containing over 200,000 registered tanks. The sample covered the following nine states: Washington, Virginia, Vermont, South Dakota, Colorado, Florida, Texas, Missouri and Kentucky. The nine states represented a variety of climates, tank environments, saturation periods, water tables, and soil conditions. Tillinghast's sample also included a variety of tank sizes (from 500 to 20,000 gallons) and contained petroleum marketers and non-marketers. Tillinghast examined the following registration periods: 1970-75, 1980-81, 1985, and 1990. The examined registration periods begin in 1970 when sti-P3 tanks first became well known to owners/operators and continue to the present.

Tillinghast successfully contacted 110 owners with immediate supervision over 385 sti-P3 tanks and secondary responsibility for approximately 2500 sti-P3 tanks at other locations. In addition, researchers contacted 37 installers throughout the geographic sample who had experience in over 5000 sti-P3 tank installations. Finally, Tillinghast contacted the Environmental Protection Agency's ten Regional UST offices as well as each of the nine State UST regulatory offices included in the sample.

Tillinghast obtained summary information on 103 environmental impairment and product liability insurance closed claims for sti-P3 tanks from STICO to identify any instances where payment was made due to a product release. Tillinghast also randomly selected eight of the 103 claims to specifically review the "cause of incident" data.

Findings

Tillinghast identified findings related to the following areas: testing of cathodic protection systems, cathodic protection monitoring practices, environmental and product liability claims, and understanding of and compliance with EPA's technical requirements.

Tillinghast's survey of tank owners and installers covered over 8,000 sti-P3 tanks. Within the surveyed population, respondents reported three instances of sti-P3 tank external corrosion -- one of which involved a product release. Of the regulators Tillinghast surveyed, those who had witnessed the removal of sti-P3 tanks reported that the tanks and sacrificial anodes were in "excellent condition upon removal." Regulators did not provide information on the ages of the tanks that were considered to be in "excellent condition upon removal."

Tillinghast reported that corrosion monitoring requirements (and the technical basis for those requirements) are not well understood by most tank owners, installers, or regulators. Furthermore, Tillinghast reported that unless an sti-P3 owner/installer signed up for STI's Watchdog program, cathodic protection monitoring for sti-P3 tanks installed since the promulgation of EPA's technical regulations was generally not being performed, although some large sti-P3 tanks users did perform independent testing.

Tillinghast's review of data from STI and from owners' research indicated that test variability can be high for corrosion monitoring tests conducted on any given site. Watchdog participants and major oil companies (many of whom conduct their own corrosion monitoring) reported few readings less than the 850 millivolt compliance point for corrosion monitoring. Tillinghast identified human error (in tank installation or testing) as one cause for obtaining disreputable corrosion monitoring results. Unusually dry soil conditions and other physical factors also influenced the accuracy of cathodic protection system testing.

Tillinghast obtained data from installers, tank owners, and major oil companies on the annual cost of corrosion monitoring. The data showed the annual cost of corrosion monitoring to range from $130 to $500 per location (each location having an average of 3.2 tanks). The impact of these costs was greatest on small, single location owners due to the necessity of hiring a contractor to travel to the site to perform the monitoring.

Tillinghast's investigation of STICO limited warranty and environmental and product liability insurance closed claims revealed that most of the sti-P3 claims that entailed both administrative and investigative costs involved improper installation techniques or errors in tank manufacturing workmanship. Fifty-six of the 103 claims incurred administrative expense but no claims costs or expenses, leaving 47 others which incurred some sort of investigative cost (e.g., tightness test). Only four of the 47 incidents in which investigative cost was incurred actually involved a claims payment. Tillinghast's review of eight randomly chosen closed claims for "cause of incident" data demonstrated that a pattern of faulty workmanship, bad installation, or a combination of both resulted in corroded sti-P3 tanks.

Conclusions

Tillinghast found no instances of external corrosion of sti-P3 tanks that had been properly fabricated, transported, and installed. Of the more than 8000 sti-P3 tank installations represented by owners and installers, only three instances of external corrosion were reported, a frequency of 0.04%, and only one involved a product release. Tillinghast did not have enough corrosion monitoring data to statistically determine an optimum monitoring frequency for cathodic protection. Tillinghast's survey concluded that less than 10% of the Watchdog participants or major oil companies who maintain their own corrosion monitoring programs and installed sti-P3 tanks in 1990, reported readings below the 850 millivolt compliance point for corrosion monitoring. Finally, Watchdog monitoring data from 1991, 1992, and the first quarter of 1993 indicate that based on cathodic protection monitoring readings, the number of sti-P3 tanks with cathodic protection readings of -850 millivolts or greater is increasing.

III. Public Comments

EPA is interested in any comments that the public may have on the content of this report, and is especially interested in any additional quantitative data commenters may provide. In particular, the Agency is interested in receiving answers to the questions listed below.

* What data are available that confirm or refute the report's findings on corrosion protection of sti-P3 USTs? In particular, have problems with corrosion protection (such as external corrosion) on sti-P3 tanks been observed? If so, what were the numbers, types, severity, and impacts of these problems? What were the ages of any sti-P3 tanks with problems with corrosion protection, and were these problems caused during, before, or after installation? What are the sti-P3 label numbers, if available, for verification purposes?

* For any sti-P3 tanks observed to have problems with corrosion protection,

including tanks and piping, did cathodic protection monitoring indicate a lack of protection? If so, when was a lack of protection found -- within 6 months of installation or during a later test? If monitoring was not performed, would it have indicated a lack of protection if it had been done?

* What data are available addressing the above issues for cathodically protected steel USTs that are not sti-P3 USTs? If problems were observed, were they observed with field installed or with factory installed cathodic protection systems?

* What information is available confirming or refuting the study's representation of the costs and benefits of cathodic protection monitoring of UST systems?

* How does the simplified, permanently installed cathodic protection monitoring system, now installed with new Federally regulated sti-P3 tanks, change cathodic protection monitoring practices and its costs and benefits?

* If the study were performed 10 years later and again 20 years later, would the findings be expected to be the same? Why or why not?

* What experiences or studies in other applications of cathodic protection may provide insights into the long-term performance of cathodic protection on USTs and the costs and benefits of cathodic protection monitoring?

IV. Schedule for Final Determination

After review and evaluation of the public comments on this notice, EPA will conduct internal deliberations to arrive at a final determination of the Agency's position on the required frequency of cathodic protection monitoring. The Agency plans to reach a determination by [Date], 1993. This determination may take the form of no action, guidance, changes to the technical regulations, or some other regulatory action.

Dated: [Date], 1993

Richard J. Guimond

Acting Assistant Administrator.

[DCSWERA1\G:\SHARE\OUST\NOTICE3.STI]

SUMMARY OF COMMENTS AND EPA RESPONSES
Notice of Data Availability in the Federal Register, October 25, 1993

The Agency received 228 comments in response to the Notice of Data Availability published in the Federal Register, October 25, 1993. In general, the commenters represent the manufacturers, distributors, and installers from the steel tank, petroleum equipment, and fiberglass and composite tank industries. A list of the commenters is attached.

The comment summaries and EPA's responses are organized into seven sections. The organization of the document is provided below.

1. General Support or Opposition

One commenter (Corrosion Associated, Inc.) feels that the impetus for revising the current monitoring requirement has been pressure from lobbyists who are trying to sell more steel tanks. He cautions the Agency to get input on the matter from corrosion experts. One commenter (Fiberglass Petroleum Tank & Piping Institute) implies that some of the impetus for the request to modify the monitoring requirement has been declining sales of sti-P3® tanks. The commenter argues that the Agency should not consider the Steel Tank Institute's request for elimination of cathodic protection monitoring requirements because its mission is to protect health and the environment, not to protect one product from competition.

Several commenters (Corrosion Associates, Inc.; Association of State and Territorial Solid Waste Management Officials [ASTSWMO]) noted that the sti-P3® tanks are still new enough that leaks due to corrosion have not been a big problem. Another commenter (NACE International) adds that its experience indicates that the average time between installation and failure of unprotected bare steel tanks is between eight and 12 years. The commenter feels that it is possible that more sti-P3® tank failures will occur in the next few years. Another commenter (New York State Department of Environmental Conservation) indicated that problems with bare steel tanks generally take 18 years to become evident. The commenter suggested that sti-P3® tanks have not yet been time tested, and that problems with the tanks will very likely occur in approximately 10 years. One commenter (Marcel Moreau Associates) noted that a proper assessment of the tanks' performance cannot be made until the tanks have been in the ground for approximately 20 years. All of these commenters argued that continued monitoring is necessary until sti-P3® tanks have been time tested.

One commenter (Fiberglass Petroleum Tank & Pipe Institute) says that the Tillinghast report does not say whether tanks will be able to resist corrosion over the 30-year tank design life. Only 53 of the 384 tanks in the sample were over ten years old. The commenter notes that even bare steel tanks generally do not develop corrosion failures for at least 10 years. The commenter therefore feels that the Tillinghast report does not prove anything.

Many commenters[1] stated that the Steel Tank Institute gives a 30-year warranty on the sti-P3® tanks. These commenters felt that the length of this warranty indicates the soundness and dependability of the sti-P3® tank. However, another commenter (Xerxes Corporation) states that the Steel Tank Institute's 30 year guarantee is immaterial to whether cathodic protection should be monitored. This commenter argues that the cathodic protection system is on the tank to insure that the tank fulfills this service life, and the monitoring is designed to audit the functioning of the cathodic protection system. Another commenter (Green Environmental & Corrosion, Inc.) states that from an engineering perspective, all engineered systems, including all tank technologies, require monitoring.

Another commenter (Fiberglass Petroleum Tank & Pipe Institute) provided copies of six articles published in the last few years in Tank Talk, a Steel Tank Institute-published newsletter about USTs. Collectively, the articles show that the Steel Tank Institute has in the past supported cathodic protection monitoring as an effective, inexpensive means of preventing leaks. This commenter notes that many national standards support cathodic protection monitoring. The standards cited by the commenter were: NACE International, Canadian

Council of Ministers of the Environment, National Standard of Canada, Petroleum Equipment Institute, American Petroleum Institute, National Fire Protection Association, and the Uniform Fire Code. The commenter notes that there are two significant areas in which the Agency's requirements are more lenient than the majority of these standards. First, the Agency insists on monitoring of the cathodic protection system within six months of installation. However, six of the seven aforementioned standards suggest monitoring at installation, while API suggests monitoring six to twelve weeks after installation. Second, the Agency is more lenient in its requirements for monitoring during the lifetime of a tank. Five of the seven standards suggest annual monitoring, while the National Standard of Canada suggests monitoring every two years. (Timing of post-installation monitoring requirements were not cited for the seventh standard.) The commenter also notes that the U.S. Department of Transportation supports annual monitoring of the cathodic protection systems used to protect petroleum pipelines in this country.

This commenter (Fiberglass Petroleum Tank & Pipe Institute) also cites papers from several cathodic protection experts who advocate monitoring of cathodic protection systems. One expert stresses that cathodic protection is inexpensive and easy to maintain. Another points out that because no tanks or pipe coatings are perfect, they must be supplemented with cathodic protection. This expert states that without adequate monitoring, cathodic protection may not continue to function. Another expert reports that a maintenance program for a cathodic protection system is necessary because the external tank coating may deteriorate or become damaged.

One commenter (Fiberglass Petroleum Tank & Pipe Institute) noted that the dielectric protective coating on an sti-P3® tank, which is 30 mil thick, is much thinner than the fiberglass coating on a steel-clad tank, and thinner than a fiberglass-reinforced-plastic tank. This commenter argued that cathodic protection devices and a frequent monitoring program are therefore necessary to ensure long term environmental protection when using an sti-P3® tank.

One commenter (Northeast Utilities Service Company) notes that his company conducts monthly tests of the rectifier (the device that powers impressed systems by converting alternating current to direct current) for impressed current cathodic protection systems as well as annual tests of the entire system for impressed and galvanic systems. The commenter's company operates many diverse types of equipment, including approximately 100 UST systems. During the past four years, the commenter has identified approximately 50 cathodic protection problems on all types of equipment, twenty of which were associated with UST systems. The commenter notes that all of the problems were identified during routine monthly or annual inspections, but that these problems would not have been identified under STI's proposal to decrease the monitoring requirement to at time of installation and after disturbance of the UST excavation.

Several commenters (Corrosion Control Specialists, Inc.; Owens-Corning Fiberglass Corporation; NACE International) stated that inspections of the cathodic protection system should be performed annually by a qualified corrosion engineer.

Several commenters (Pump Masters, Inc.; The Coen Company) suggested that, based on their experience with several sti-P3® tanks each, the monitoring interval should be extended. One commenter (Pump Masters, Inc.) suggested that monitoring be performed at

10-year intervals, while another (The Coen Company) suggested monitoring the cathodes every five or 10 years in some soil conditions.

One commenter (Chem Met, Ltd., P.C.) suggested that if the monitoring interval is to be extended, the present schedule should be maintained for the initial five years, and then extended in individual circumstances if experience shows that the system is being properly maintained and monitored.

Another commenter (Beth Anderson) feels that requiring corrosion protection testing every three years for tanks may be excessive, but feels that the requirement for corrosion protection testing of steel piping should not be eliminated. The commenter bases this opinion on her own experience that pipes are often the cause of UST releases, and on the fact that the Tillinghast report did not appear to include a consideration of steel piping.

One commenter (New York State Department of Environmental Conservation) also indicated that if sti-P3® tanks were exempted from the monitoring requirement, all cathodically protected tank and piping systems would have to be given the same exemption. The commenter believes that an exemption for only the sti-P3® tanks would make it difficult to determine which tanks and piping systems required monitoring and which did not.

Several commenters (New York State Department of Environmental Conservation; Letter to David Ziegele from Anonymous) noted that anodes have a finite expected life span. The commenters indicated that the cathodic protection system must be monitored to determine when the useful life of the anode is over so that the system can be upgraded to ensure continued protection of the tank.

One commenter (Metal Products Company) feels that for years tank manufacturers have known how to produce a reliable tank but have chosen not to because consumers would not buy such an expensive tank. The commenter feels that regulations will lead people to buy reliable tanks like the sti-P3® tank.

Response

The Agency does not question the general quality or the short-term integrity of sti-P3® tanks. However, the Agency agrees with commenters who state that the populations of sti-P3® tanks that were included in the Tillinghast report and those used in UST systems throughout the country are relatively young. While many commenters noted that sti-P3® tanks carry a 30-year warranty, because no sti-P3® tanks have yet been in use for 30 years, the Agency takes the warranty as an indicator of predicted, rather than actual, performance. While corrosion is a complex process and age is not the sole factor in determining a tank's likelihood to fail due to external corrosion, the Agency agrees that age does play a role. The Agency still believes what was stated in the preamble to the proposed UST technical rules, that generally "[i]n order to be effective, these corrosion protection systems must be inspected and maintained. Corrosion protection systems can fail in a number of ways. For example, coatings can deteriorate, wire leads to cathodic protection can break, sacrificial anodes can be consumed, impressed current can be shorted or otherwise fail, adequate potential may not be maintained." See 52 Fed. Reg. 12706 (1987). This reasoning supported the requirement for *monitoring in the final technical rules promulgated in 1988, and the new information before the Agency does not lead it to question this finding. The Agency received no compelling data or arguments demonstrating that sti-P3® tank cathodic protection systems can be shown with certainty to remain protected against both short- and long-term corrosion processes if unmonitored, and therefore that regular monitoring of cathodic protection systems is unnecessary.*

Regarding the comment cautioning the Agency to get input on the matter from corrosion experts, the Agency agrees that getting such input is wise, and responds that this was one of the reasons for the Notice of Data Availability and request for comments. Input from corrosion experts was received and considered. Many experienced professionals in the corrosion prevention and control community advocate periodic monitoring of cathodic protection systems. In response to the comment arguing that the Agency should consider protection of health and the environment and not protection of one product, the Agency responds that the Notice of Data Availability and request for public comments were intended in large part to gather information to see if the monitoring requirements could be relaxed without diminishing protection of human health and the environment.

While the Agency agrees that any problems with sti-P3® tanks are more likely to emerge after the population has aged several more years, the Agency notes that commenters who stated that sti-P3® tanks will fail in increased numbers in the next few years or about 10 years after installation did not provide data supporting these comments.

The Agency agrees with the commenter who noted that several industry and government standards for cathodic protection monitoring are more stringent than EPA's UST requirements. The Agency also agrees with this commenter that corrosion experts have advocated monitoring of cathodic protection systems.

The Agency agrees with the commenters who suggested that regular monitoring of any UST corrosion protection system, including the sti-P3® cathodic protection system, is a sound engineering practice. The Agency acknowledges the comment noting that the dielectric coating on an sti-P3® tank is typically much thinner than, and different in composition from, the fiberglass in both fiberglass tanks and fiberglass-clad steel tanks. However, this comment, from a fiberglass-centered trade organization, does not provide information on the performance of this coating.

Regarding the comments that monitoring of cathodic protection systems should be performed annually and that it should be done by a qualified corrosion engineer, the Agency notes that its inquiry is limited to STI's request to relax the monitoring requirements, the Tillinghast report, and the Notice of Data Availability; a request for strengthening requirements is outside the scope of the current discussion. In any event, the Agency disagrees with these comments on two counts. First, the Agency believes that the 3-year interval remains appropriate for the same reasons discussed in the preamble to the final technical rule, which stated, "the Agency is now requiring in the final rule that all cathodic protection systems be tested within 6 months of installation and at least every 3 years thereafter. These intervals are sufficient to detect any damage or failure of the system and to take remedial action in time to prevent structural failures due to corrosion." See 53 Fed. Reg. 37137 (1988).

Second, the Agency still believes in the soundness of its decision not to require that cathodic protection monitoring be conducted solely by corrosion experts. As discussed in the preamble to the final rule (see 58 Fed. Reg. 37136 (1988)), in response to the Agency's proposal of such a requirement, some "commenters pointed out that the maintenance, operation, and inspection of an installed cathodic protection system could be performed by people who have much less training than a corrosion expert. EPA agrees with these comments, recognizing that most of these inspections are now being conducted by trained specialists." Comments received in response to this Notice of Data Availability present no data or arguments that cause the Agency to question this decision. While the Agency agrees with the Tillinghast report's finding that variability in cathodic protection readings is reduced through the use of better protocols, the Agency believes that requiring that the tester meet the definition of corrosion expert may lead to increased costs without increasing the protection of human health and the environment.

The Agency has examined commonly accepted industry standards for monitoring of cathodic protection systems on underground storage tanks and pipelines. The Agency found that many nationally held standards are more stringent. This lends further support to EPA's decision not to relax the current requirements.

The Agency disagrees with suggestions of monitoring intervals of five or 10 years instead of the current three years; these significantly longer intervals may allow steel tanks whose cathodic protection systems are not functioning properly to suffer external corrosion and leak. The Agency notes that the pace of external corrosion is highly dependent on characteristics of the metal structure and also of the surrounding soil, which vary widely. The Agency also finds the suggestion of extending the monitoring schedule on a case-by-case basis based on past monitoring non-persuasive. This is because of the additional risk of external corrosion should the cathodic protection system not continue to function properly, and also because it would be difficult for owners and operators and for regulatory personnel to keep track of the various individual schedules and to ascertain the compliance status of each tank. Similarly, the Agency agrees with the commenter who believes that an exemption for only sti-P3® tanks, versus all cathodically protected steel tanks, would make it difficult to determine which tanks required monitoring and which did not.

Regarding the comment on cathodic protection monitoring of steel piping, the Agency agrees that pipes are often the source of UST releases, but notes that this is outside the scope of both the Tillinghast report and the Notice of Data Availability.

The Agency agrees that anodes do have finite life spans, and notes that life spans are highly dependent on particular site conditions. The Agency also agrees that the end of anode life is one of the conditions that causes monitoring results to not meet the industry standard for verifying cathodic protection. Appropriate action to determine the cause or causes of such non-compliant results should be taken.

Based in part on the relative youth of the sti-P3® tank population and the stricter requirements of several national standards, the Agency believes that the current requirement for monitoring of sti-P3® cathodic protection systems should not be relaxed.

1.1 Changing the Tank Design Standards and Associated Monitoring Requirements

One commenter (State of Missouri, Department of Natural Resources) feels that rather than defer cathodic protection testing, a more appropriate approach might be to expand the rule to require periodic testing of all types of tanks to ensure continued performance of critical design parameters within specifications on an annual basis. This commenter suggests several requirements, including testing clad USTs to ensure electrical isolation of the inner steel tank from the surrounding soil, periodic diameter measurements of FRP tanks, and periodic testing of the inner coating of FRP products.

Another commenter (ASTSWMO) feels that monitoring other tank systems, in addition to maintaining the current requirements, should be considered.

One commenter (KCL Projects, Ltd.) stated that there is a risk of external corrosion with fiberglass-clad steel tanks. This commenter indicated that fractures occur when tanks are dropped or dented during installation, or from stresses resulting from the differences in the coefficients of thermal expansion between steel and fiberglass. This commenter did not, however, offer a recommendation for additional Agency action with regard to these tanks.

This commenter (KCL Projects Ltd.) also stated that coated tanks approved by Underwriters Laboratory, such as "subject 1746" tanks, have never been required to meet the same strength or corrosion-resistance standards as non-metallic underground tanks, and therefore cannot be assumed to offer the same corrosion protection as non-metallic tanks. This commenter argued that the Agency should require that every new UST meet UL standards for Class 16 tanks (nonmetallic units with secondary containment).

Response

These comments are outside the scope of the Agency's request for comments in the Notice of Data Availability. The Agency explicitly limited its request to the Tillinghast report and to external corrosion on cathodically protected steel tanks.

In any event, the Agency currently does not have sufficient information to support a change in the monitoring requirements for other tank technologies at this time. The Agency does not agree that requiring every new UST to meet UL standards for Class 16 tanks (nonmetallic units with secondary containment) is necessary to guard against releases.

New steel systems with ongoing corrosion protection, including cathodic protection, were allowed in EPA's technical rules because such systems have been shown to provide protection from galvanic corrosion, a major cause of failure in USTs. None of the above comments cause the Agency to question the conclusions in the final technical rules. The Agency believes that proper use and monitoring of cathodic protection systems adequately protects human health and the environment.

1.2 Installation Errors Necessitate Monitoring

1.2.1 General Installation Errors. Several commenters (KCL Projects Ltd.; Owens-Corning Fiberglass Corporation) argued that there is a risk of external corrosion with sti-P3® tanks. They stated that there is no way to locate fractures in the external coating surrounding the steel tank. These fractures occur when tanks are dropped or dented during installation, damaged during shipping, or damaged by improper backfill support or other improper installation methods. Once the external coating has fractured, it can peel away from the steel, exposing the steel to the environment and increasing the likelihood of external corrosion by creating an opportunity for accelerated point corrosion. Therefore, they concluded that the sti-P3® tank design does not provide absolute protection against external corrosion, and that cathodic protection systems should be used and monitoring should be conducted regularly to ensure that the systems are working properly.

One commenter (Owens-Corning Fiberglass Corporation) implied that monitoring of cathodic protection systems should always be required. The commenter noted, however, that if monitoring of the anodes was no longer to be required for sti-P3® tanks, the Agency should consider additional restrictions to ensure that the tank coating is not compromised prior to or during installation. The commenter proposed that the Agency require (1) spark testing at the jobsite to detect damage resulting from manufacturing defects and shipping, (2) the use of "self compacting" gravel backfill that will keep the tank from slumping and cracking, and (3) integrity testing of the coating.

One commenter (STICO [Steel Tank Insurance Company]) states that it knows of five external corrosion failures of sti-P3® tanks, and that the tanks all shared the characteristics of improper installation and a lack of monitoring. STICO believes these failures would have been prevented by proper testing at the time of installation. This commenter believes that, if properly installed and monitored, sti-P3® tanks provide long-term corrosion protection.

Many commenters (International Association of Tank Testing Professionals; New York State Department of Environmental Conservation; ASTSWMO; Corrosion Associates, Inc.; State of Michigan, Department of State Police; Letter to David Ziegele from Anonymous; STICO; Pump Masters Inc.; Charles A. Frey; Brown-Minneapolis Tank; Highland Tank & Manufacturing Company #7; Green Environmental & Corrosion Inc.; Northeast Utilities Service Company) stated that failures of sti-P3® tanks result from improper installation practices that violate the integrity of the cathodic protection system, and that damage to the cathodic protection system is difficult or impossible to detect at installation. One of these commenters (International Association of Tank Testing Professionals) cited specific examples of compromise to the cathodic protection system, including damage to external dielectric coating materials; failure to remove protective covers from anodes; contacts with piping and other objects during installation; and damage to anodes or insulating bushings. These failures would be detected if proper installation practices and follow-up cathodic protection system monitoring were employed.

One of these commenters (Highland Tank & Manufacturing Company #7) suggested that monitoring at installation would avoid potentially litigious situations in which the installation is complete and the owner must get the installer to correct what is now an expensive problem. Sometimes the hassle of these situations leads the owner to ignore the problem. Two of these commenters (Pump Masters, Inc.; Brown-Minneapolis Tank) suggested that the cathodic protection system be monitored at the time of installation and any time an excavation is disturbed by construction or retrofit activity, and another commenter (Charles A. Frey) suggested monitoring the cathodic protection system within six weeks of installation. One commenter (Corrosion Associated, Inc.) stated that monitoring should be conducted one year after installation.

One of these commenters (Northeast Utilities Service Company) notes that even when installations are performed properly, cathodic protection systems are often damaged during backfilling and post-installation work. The commenter suggests that if the Agency removes the periodic monitoring requirement but requires monitoring after installation, the cathodic protection system should be monitored after (1) backfilling, (2) application of final grade, and (3) installation of all surface structures.

Response

The Agency agrees with commenters who note that problems can result and have resulted from improper installation of sti-P3® tanks. Information from many sources, including the Tillinghast report, indicates that, although documented cases of sti-P3® tank failure due to external corrosion may be infrequent, when such failures occur they can usually be attributed to installation errors. However, again because of the relative youth of sti-P3® tanks, the Agency does not believe that this means that causes of external corrosion other than installation errors are not possible. In addition, while problems due to installation errors may be likely to be revealed soon after installation, if there are problems due to causes materializing after installation, they will come to light later, because the causes occurred later. This, together with the youth of sti-P3® tanks relative to their expected service life, leads the Agency to believe that the fact that most problems to date are from installation errors does not mean that any problems in the future also will be.

The Agency understands that some tank owners or installers perform cathodic protection monitoring at installation. The Agency believes that this is a sound engineering practice that can be of benefit to tank owners and, of course, one that meets the requirements in EPA's regulation that systems be tested within six months of installation. The Agency believes its current requirement to monitor the cathodic protection system within six months of installation is sufficient to detect a lack of cathodic protection before external corrosion causes premature failure. The Agency believes that the reasoning in the Preamble to the final technical rule, at 53 Fed. Reg. 37137 (1988) remains sound, as it states "the Agency is now requiring in the final rule that all cathodic protection systems be tested within 6 months of installation and at least every 3 years thereafter. These intervals are sufficient to detect any damage or failure of the system and to take remedial action in time to prevent structural failures due to corrosion."

The Agency believes that cathodic protection monitoring performed at the current frequency is sufficient, and therefore does not need to be enhanced to require monitoring at installation.

1.2.2 Pre-engineered Cathodic Protection Systems and Installation of Anodes. Several commenters (Piping and Corrosion Specialties Inc.; Chem Met, Ltd., P.C.) state that a cathodic protection system must be designed for the actual conditions where it will be used in order to function properly. The standard, factory-installed cathodic protection systems furnished by the Steel Tank Institute manufacturers are not designed for specific job conditions. The commenters feel that a standard design will not work in every location where it could be installed. One of these commenters (Chem Met, Ltd., P.C.) feels that a longer monitoring interval may not be acceptable in all such cases.

Another commenter (Corrosion Control Specialist Inc.) stated that he has tested many sti-P3® tanks that have pre-engineered cathodic protection systems. According to this commenter, not one tank has been fully cathodically protected without needing to add anodes to the pre-engineered system. The commenter reports that pre-engineered cathodic protection systems may not meet the specific conditions at a site, such as soil resistivity. The commenter stated that although the sti-P3® tank has an excellent coating system, the failure to monitor for corrosion could eventually lead to a tank failure.

Another commenter (Fiberglass Petroleum Tank & Pipe Institute) notes that the sti-P3® system is manufactured and sold for universal application. The commenter notes that many corrosion engineers advocate a corrosion survey of the tank installation site before the cathodic protection system is installed in order to insure that the proper anode and coating materials will be used. The commenter cites the Underwriters Laboratories standard UL 1746 as evidence that Underwriters Laboratories recognizes that a standard pre-engineered cathodic protection system should not be installed in all soil conditions. The commenter concludes by noting that about half of the soil in the United States is corrosive, having a 4,000 ohm-cm reading, and implies that the standard sti-P3® tank can not successfully work in such soil. Therefore, the commenter feels that the Agency should mandate a six-month monitoring interval for sti-P3® tanks in soil of 4,000 ohm-cm resistivity.

One of these commenters (Piping and Corrosion Specialties Inc.) states that the Steel Tank Institute has never used National Association of Corrosion Engineers recommendations in the design, installation, and testing of their pre-engineered cathodic protection systems. The commenter notes that the life expectancies of cathodic protection systems can vary from a few years to several years. The commenter concludes that periodic testing would be the only way to confirm that the system is operating properly.

One commenter (Owens-Corning Fiberglass Corporation) submitted a report from Harco Technologies showing that sti-P3® tanks built in the last four years are made with zinc anodes, which are weaker than magnesium anodes. The report notes that the zinc anodes are not field tested, and that much of the successful history of the sti-P3® tank is based upon the performance of magnesium anodes in use on older models.

Several commenters (State of Maryland, Maryland Department of the Environment; Piping and Corrosion Specialties Inc.) noted that sti-P3® tanks are generally constructed with anodes made of either zinc or magnesium. These commenters expressed concern that installation sites are rarely checked for soil resistivity, the main factor that determines which type of anode should be used on the tank. The commenters noted that when anodes are installed in an improper environment, they might initially provide protection, but shortly thereafter they may not be useful. The commenters provided the example of a magnesium anode that is installed in an environment with low soil resistivity, an environment in which a zinc anode would be more appropriate. The magnesium anode would be used up rapidly due to self-corrosion, leaving the tank unprotected. The commenters also noted that zinc anodes in an environment with high soil resistivity will only provide adequate protection while the coating surrounding the anode is present. Once the coating breaks down, the anode cannot supply protective current and the tank corrodes. The commenters concluded that cathodic protection testing should be continued to provide a warning when anodes cease to be effective.

One commenter (Corrosion Associates, Inc.) notes that almost all of the tanks that he has observed being installed have been equipped with zinc anodes and backfilled with clean sand or pea gravel, which are high resistivity media. The commenter notes that some of these tanks lose protective potential after a few years, and he believes this is due to passivation of the zinc anode. The cost of excavation to prove that this is the case is prohibitive, so often additional magnesium anodes are drilled in to raise the potential to protective levels. The commenter feels that this is an added expense that would not have been necessary had magnesium anodes been used in the first place.

Response

The Agency agrees that various combinations of site conditions and anode materials exist at sti-P3® installations and at installations of other tanks with factory installed cathodic protection systems. The Agency agrees with those commenters who recommend periodic cathodic protection monitoring as the best way to measure protection against external corrosion at any site regardless of site conditions. The Agency also notes that efforts to determine the proper type of anode to use for particular site conditions, such as pre-installation corrosion surveys, have been performed at sti-P3® installations.

With regard to the commenter who feels that the Agency should mandate a six-month monitoring interval for sti-P3® tanks in soils of a certain resistivity, the Agency notes that requests to increase the stringency of the monitoring requirement are outside the scope of STI's request, the Tillinghast study, and the Notice of Data Availability. In any event, the Agency disagrees with the commenter. The Agency still holds the beliefs found in the Preamble to the final technical rule at 53 Fed. Reg. 37126 (1988), which reads, "EPA continues to believe that use of a single resistivity variable is inadequate to measure the propensity to corrode." The Agency believes, as stated above, that the three year interval allows sufficient time to take remedial action in order to prevent failure.

The Agency acknowledges that the sti-P3® tank design for cathodic protection is a conservative one, intended to work in a wide variety of conditions. However, the Agency agrees with commenters who report that anodes can be utilized that may not be appropriate for all specific site conditions. In addition, the anode selection and design specifications for factory installed cathodic protection systems that were not manufactured to the sti-P3® specification are not known.

Therefore, the Agency believes that variation in site conditions and the potential for the selection of inappropriate anodes for the cathodic protection system warrant periodic cathodic protection monitoring of sti-P3® tanks. The Agency believes that this requirement is equally appropriate for the less-understood, non-sti-P3® cathodically protected steel tanks as well.

1.3 Changing Site Conditions Necessitate Monitoring

Another commenter (Government of the District of Columbia, Environmental Regulations Administration) noted that anodes corrode in the process of generating protective current. Generally, an adequately designed anode requires no monitoring in the early years of service, provided that the cathodic protection system is checked at installation and there are no structural disturbances during the course of its operation. As the system gets older than 15 years, monitoring is advisable. Another commenter (Electrochemical Devices, Inc.) also noted that where environmental conditions are constant and cathodic protection is maintained, tank potentials will not vary for the life of the anode. This commenter felt that it might be acceptable to relax the frequency of the monitoring requirement, although he felt that in general monitoring was a valuable practice and should be continued.

Several commenters (Xerxes Corporation; NACE International; Northeast Utilities Service Company; New York State Department of Environmental Conservation) argued that changing site conditions justify frequent monitoring. One of these commenters (Xerxes Corporation) states that underground conditions constantly change. Corrosion rates rise and fall as water passes in and out of an area, and the addition of power lines, new buildings and underground piping near a tank location can create disturbances that damage cathodic protection systems. This commenter stated that the typical owner may not be aware of these disturbances, or the damage that they may cause to the corrosion system. The commenter believes that the frequency of the monitoring requirement ensures that any compromise in the protection system will be detected in a timely manner.

Another commenter (NACE International) states that there are some specific reasons to require periodic testing of the cathodic protection system. Those reasons are: (1) changes in UST configuration; (2) electrical changes such as stray current/interference, shorts to other structures, wires cut or damaged, and anodes consumed; (3) environmental changes such as drainage, earthquakes, settlement, and pollution/contamination; and (4) nearby effects such as new construction and utility changes or additions.

One commenter (Northeast Utilities Service Company) notes that operators of facilities do not always inform parties that monitor cathodic protection systems that a tank has been disturbed so that they may initiate testing after the disturbance. Under the current regulatory schedule, problems of this nature are identified during the next cathodic protection monitoring. Without a periodic monitoring requirement, problems caused by disturbances may go unnoticed and lead to possible releases to the environment.

One commenter (New York State Department of Environmental Conservation) noted that the Tillinghast report cites an incident of sti-P3® tank failure as a result of a massive stray current that overpowered the anode. The commenter notes that although the Tillinghast report attributes most corrosion failures to installation damage or excavation disturbances, in this case the report does not mention any excavation disturbance associated with the incident. This commenter concluded that monitoring of the cathodic protection system would have detected the situation so the owner or operator could have taken steps to protect the tank before it corroded and failed.

Response

The Agency believes that the likelihood of changing site conditions surrounding an UST system warrants regular cathodic protection monitoring by the owner or operator. Owners and operators may not be aware of every occasion when the site conditions surrounding an UST, or a group of USTs, have been disturbed. Site conditions, and their effects on an underground structure's corrosion protection, change for many reasons. These include heavy rainfall that can increase soil moisture and therefore the likelihood for external corrosion. Also relevant are nearby construction activities that can disturb the soil, leading to accelerated corrosion due to less homogeneous tank backfill. Construction also can short circuit other metal structures to the tank. In this case, anodes, as they protect more exposed metal, will not last as long as they would otherwise, potentially leading to external corrosion where none would otherwise occur. In addition, electrical changes, such as stray currents from electrical utility lines or changes in nearby impressed current cathodic protection systems, can render a cathodic protection system less effective.

If the owner or operator does not realize that conditions surrounding the USTs have changed, the USTs can become more vulnerable to corrosion and the possibility of a leak. The Agency believes that owners or operators will know when some changes occur, including most construction activity disturbing the backfill, but also believes that there are many opportunities for site conditions to change without the owner or operator realizing the change has taken place. Furthermore, the Agency believes that, without a schedule, some owners and operators will, even if they realize changes have taken place, not properly monitor the cathodic protection system to ensure it is still functioning properly.

Because so many factors that can impact the cathodic protection system are beyond the control of and can occur without the knowledge of UST owners and operators, it is not feasible to rely on owner and operator discretion to determine the appropriate intervals for monitoring a cathodic protection system. The Agency believes that the current monitoring frequency allows owners and operators to detect changes in the UST environment that can compromise cathodic protection systems and to take timely and appropriate actions to protect those systems. Finally, the Agency believes it would be difficult for implementing agencies to monitor compliance with, and enforce, a requirement to monitor only after site conditions have changed due to construction or another disturbance of the tank excavation.

1.4 Specific Tank Data Provided

1.4.1 Data on Cathodic Protection Systems. Several commenters (Owens-Corning Fiberglass Corporation; Fiberglass Petroleum Tank & Pipe Institute) cited a study that was conducted from 1980 to 1983 by the PSG/Hinchman Company for Owens-Corning Fiberglass Corporation. In this study, 76 sti-P3® tanks were tested in four states, and measurements were made relative to the well-established industry standard criterion of a negative potential voltage of at least 0.85 volt (-0.85 volt), as measured between the structure and a saturated copper-copper sulfate half-cell contacting the soil. The Hinchman Company found that although 63 (83%) of the 76 tanks were adequately protected from external corrosion failures, eight (10%) tanks did not meet the selected criterion for cathodic protection because their insulating bushings were shorted, and five (7%) tanks did not meet the selected criterion for cathodic protection for unspecified reasons. These commenters also cited a report (The Geyer Report) that documents the results of surveys conducted by the Steel Tank Institute during 1986. Data from this report indicate that 22%[2] of 591 tanks surveyed and tested did not meet the industry standard -0.85 volt criterion, as required in National Association of Corrosion Engineers' Recommended Practice RP-02-85.

Another commenter (State of Missouri, Department of Natural Resources) reports that it has inspection records for 1,962 USTs. Six of these inspections specifically identified noncompliance with the corrosion protection requirements. Five of these six records covered facilities that are believed, based on registration data, to be sti-P3® USTs. Five of these six records indicate that the initial violation was the owner's or operator's failure to test the cathodic protection system. Three of the six records provide test results indicating that cathodic protection systems were not operating properly.

Another commenter (State of Maryland, Maryland Department of the Environment) noted that several corrosion protection companies that test hundreds of tanks per year across the country report an almost 80% failure rate of cathodic protection systems when checked against the -0.85 volt criterion. (The commenter did not state whether the tanks examined were sti-P3® tanks.) This failure rate implies that most cathodically protected tanks are not adequately protected against corrosion, and that continued monitoring is the only way to detect likely problems with the tanks.

Another commenter (Green Environmental & Corrosion, Inc.) notes that her firm tests a significant number of cathodic protection systems every year. Based on their results, over 60% of sti-P3® systems do not meet the criteria for cathodic protection. One commenter (Letter to David Ziegele from Anonymous) notes that he is aware of single wall sti-P3® tanks originally sold by his company and others that are not cathodically protected and cannot pass a precision test.

Another commenter (Beth Anderson) questions the reliability of sti-P3® tanks that have been in the ground for 20 years or more. The commenter reports seeing significant depletion on some cathodic protection systems (i.e., the anode) after 15 to 20 years of service. The commenter notes that in these instances there was no corrosion damage on the tank, but that the anodes had been replaced to provide better long-term protection. The commenter feels that failure to replace the anodes would have put the tanks at risk of corroding.

One commenter (ASTSWMO) notes that the Tillinghast report says that less than 10% of the Watchdog participants of major oil companies who maintain their corrosion monitoring programs and installed sti-P3® tanks in 1990 reported readings below the -0.85 volt criterion. The commenter expresses concern that these tanks are only three to four years old, and that as many as one in ten are out of compliance with acceptable levels for corrosion protection. The commenter notes that these substandard test levels may be due to factors other than anode failure, but feels that periodic monitoring of the cathodic protection system would indicate the need for further investigation to determine the cause of the substandard readings.

1.4.2 Data on sti-P3® Tanks. Several commenters (Fargo Tank Company; Pump Masters Inc.; Highland Tank & Manufacturing Company # 13, #12, and #10; E.E. Wine Inc.) described their experiences with the removal and inspection of sti-P3® tanks. One of these commenters (Fargo Tank Company) described four sti-P3® tanks that had been in the ground for more than six years. This commenter reported that the four tanks showed no internal or external corrosion, pitting or scratching. Another commenter (Pump Masters, Inc.) described two sti-P3® tanks that had been in the ground for 12 and 14 years respectively. The exterior coatings on the tanks appeared to be in very good condition, with no evidence of peeling or deterioration. Several commenters (Highland Tank & Manufacturing Company #13; Highland Tank & Manufacturing Company #12) described the condition of several sti-P3® tanks removed after seven and ten years in the ground by saying that they looked like the day they were installed. Another commenter (Highland Tank & Manufacturing Company #10) described the condition of an 8,000 gallon, five-year-old sti-P3® tank. The tank had some scratches in its coating and a light gray film covering on the area of the scratches. The commenter said the gray film was the action of the anodes working to protect the scratches and therefore to protect against corrosion. Another commenter (E.E. Wine, Inc.) excavated to the top of an sti-P3® tank that had been buried for seven years, and noted that the tank was in good condition.

Several other commenters (James B. Phillips Company, Inc.; Beaver Petroleum Co. Inc; Crawford Fuel and Oil; Bell Petroleum Ltd., Aviation Products Division; Fred's Plumbing and Heating #1; Fred's Plumbing and Heating #2; Sammy L. Thorlup; Benit Fuel Sales & Service Inc.; Highland Tank & Manufacturing Company #8; Alliance Oil Service Company; Baird Petroleum Equipment Corporation; James Islintu) described sti-P3® tanks based on visual observation during removal. Although the commenters did not provide the ages of the tanks, they reported that the tanks showed no evidence of corrosion, and that in some cases original labelling and stencilling were still legible on the external tank surfaces.

Many commenters[3] stated that the sti-P3® tank is an extremely reliable tank. These commenters stated that based on their experience with installing or using sti-P3® tanks, they knew of few or no problems associated with the tanks. These commenters stated that of the more than 200,000 sti-P3® tanks that have been installed, there have been only seven reported failures. One of these commenters (Highland Tank & Manufacturing Company #2) stated that although more than 200,000 sti-P3® tanks have been installed, he only knew of one reported product release from an sti-P3® tank.

One commenter (Brown-Minneapolis Tank) stated that the Tillinghast report mentions only two failures out of the 8,000 sti-P3® tanks included in its sample. The failures of these tanks were due to improper installation and not the tanks themselves.

One commenter (STICO) states that based upon actuarial assessments, the sti-P3® tank has the lowest insurance premium rate as a result of its comparatively low risk exposure -- less than 1/10 of 1% of all sti-P3® tanks fail. He acknowledges that this low risk exposure is due largely to compliance with the cathodic protection monitoring requirement to monitor within six months of installation. He reports that he knows of five external corrosion failures of tanks, and that they all shared characteristics -- improper installation and a lack of monitoring on the part of the owner/operator -- which he believes could have been prevented by proper testing at the time of installation. He believes that sti-P3® tanks provide long-term corrosion protection.

Another commenter (Green Environmental & Corrosion, Inc.) notes that the Steel Tank Institute Watchdog Program was finding a large number of non-compliant cathodic protection readings. According to the commenter, this lowered owners' faith in the system, which in turn reduced the number of sti-P3® tanks sold.

Response

In response to concerns about internal corrosion, the Agency points out that the Tillinghast report, like external cathodic protection systems, addresses only external corrosion. In addition, the Agency's information is that internal corrosion of steel tanks historically poses a much smaller risk of release than external corrosion.

The Agency believes that commenters who cited the Geyer Report as indicating that 22% of 591 tanks surveyed and tested did not meet the -0.85 volt criterion misinterpreted the report's findings. Tables 2 and 3 of the Geyer Report show a finding that 10 or 11%, not 22%, of the universe of 591 tanks surveyed were below the -0.85 volt protection criterion.

The Agency notes that the -0.85 volt potential cathodic protection criterion is a conservative one that has been documented over many years as providing protection of steel in a wide variety of conditions. Furthermore, the Agency is aware that site conditions such as extreme backfill dryness, which renders neither the tank nor the anodes cathodically active, can cause non-compliant readings. Therefore, readings more positive than -0.85 volts do not necessarily indicate that a tank is corroding. The Agency notes that several commenters provided data indicating that a significant fraction of cathodic protection monitoring is not able to show that the systems monitored are, with certainty, meeting industry standards. However, the criterion is a well-established industry standard, and its use is a certain and efficient way to determine that a tank has cathodic protection. When cathodic protection systems do not meet this criterion, owners and operators should investigate the cause of the failure in order to be able to achieve the standard. The Agency believes that the current cathodic protection monitoring requirements of monitoring within six months of installation and at least every three years afterward are adequate and detect potential failures of cathodic protection systems.

In response to comments on sti-P3® tanks, the Agency acknowledges that many experienced professionals believe in their reliability. However, few commenters provided data covering a large number of tanks. These comments do not compel the Agency to reduce the required frequency of cathodic protection monitoring, due largely to a lack of adequate data and to the youth of the population of sti-P3® tanks relative to their expected useful life.

2. Validity of Tillinghast Report

A commenter (State of Michigan, Department of State Police) states that the Tillinghast report is based on a sample that contains a disproportionate number of tanks that were installed after promulgation of the UST rules. This sample, therefore, does not provide sufficient data for identifying the ideal monitoring schedule. The commenter feels that without additional data, there is not adequate evidence to support any change in the monitoring requirements.

Several commenters (Xerxes Corporation; Piping and Corrosion Specialties Inc.) believe that there is no statistically reliable data to either affirm or refute the Steel Tank Institute's assertion that the sti-P3® tank has a very good performance record. One commenter (Xerxes Corporation) notes that much of the information in the report is based on anecdotal information provided by people who are not aware of the limits of their knowledge. To be statistically valid, the survey would need to have a broader population and look at tanks in different soil conditions and of different ages. This commenter also notes that the survey is full of assumptions, uncertainties, and admissions of deficiencies.The other commenter (Piping and Corrosion Specialties Inc.) noted that some of the conclusions in the Tillinghast report are suspect. Specifically, this commenter notes that the report included only 110 owners who had direct knowledge of 385 tanks and secondary knowledge of 2,500 tanks, and 37 installers who had knowledge of 5,000 tanks. The report stated that the cathodic protection requirements are not well understood by many owners, installers and regulators, and that monitoring of the cathodic protection system was generally not being performed. This commenter questions how Tillinghast therefore can conclude that sti-P3® tanks do not need to be monitored when many of those surveyed were not monitoring or did not understand the cathodic protection systems.

Another commenter (Green Environmental & Corrosion, Inc.) contends that the Tillinghast report is not authoritative. The commenter believes that the Tillinghast report is extremely limited for the purpose of rewriting a federal regulation, and that significantly more information should be obtained. The commenter further notes that the owners of the tanks surveyed were under the Steel Tank Institute Watchdog Program, and, because they receive test results under the program, knew the condition of the cathodic protection systems prior to the survey. They would have been informed of the failure of the cathodic protection systems and would have taken preemptive measures to avoid damage to their tanks.

One commenter (Green Environmental & Corrosion, Inc.) stated that the small number of insurance claims against STICO for sti-P3® tank failures is not a valid indicator of the rate of sti-P3® tanks failures. This commenter argued that the numbers would not be valid because many owners would first proceed to their respective state insurance funds for coverage in the event of a failure and because in some cases STICO has refused to honor claims made against it due to what it called contractor negligence.

One commenter (Fiberglass Petroleum Tank & Pipe Institute) says that the Tillinghast report is biased by geographic tank distribution. For example, the sample did not include any tanks from the midwest (Region 5) and only 1.7% of the tanks selected were located in the northeast (Regions 1 & 2). The majority of the tanks in the sample (50.9%) were located in

EPA Regions 6, 7 & 8. The commenter further noted that the geographic areas chosen for the sample are not known to be areas where corrosive soils and stray currents are typically found in UST settings. The commenter argued that a representative sample should have included such states as Ohio where cathodic protection has been problematic due to low soil resistivity and New Jersey where most USTs are installed in urban settings subject to stray currents. In sum, the commenter feels that the Tillinghast report sample selection is biased towards sti-P3® tank locations in the most favorable soil conditions. The commenter notes, however, that even in these favorable settings the Tillinghast report shows an unacceptable level of cathodic protection for many sti-P3® tanks.

This commenter (Fiberglass Petroleum Tank & Pipe Institute) also stated that the Tillinghast contacts were not appropriate because they could only produce anecdotal information. This commenter argues that interviewing installers was inappropriate because it was in the installers' best interest not to identify problems with their installations. The commenter further noted that only 11 of the 37 installers interviewed had experience with sti-P3® tank removals. This commenter also questions the validity of interviews with major oil company representatives. Although not identified in the Tillinghast report, this commenter believes these major oil companies had to be Exxon, Chevron, Shell, Texaco, Mobil and ARCO. This commenter noted that these companies are all FRP tank users and have only incidental experience with sti-P3® tanks. The commenter indicated that while Amoco could also have provided comments, this company has discontinued the use of sti-P3® tanks and therefore the commenter believes that Tillinghast would not have interviewed them for this report. Finally, this commenter noted that the only other company that could have been included is Marathon, which is owned by USX, a steel producer. This commenter argued that Marathon's comments would therefore be biased in favor of sti-P3® tanks.

One commenter (Letter to David Ziegele from Anonymous) feels that the only way to know the truth about sti-P3® tanks is to depose every sti-P3® tank manufacturer under oath and survey every owner of a cathodically protected UST.

Response

The Agency acknowledges the comments regarding the validity of the Tillinghast Report. In its decisionmaking process, the Agency has evaluated and considered the data and information presented in that report and all other information submitted to the docket as of the end of January, 1994, on their own merits.

The Agency notes that the Tillinghast report is the most comprehensive of its kind to date, and includes both "hard" data, such as that from the Steel Tank Insurance Company (STICO), as well as "soft" data, such as estimates from installers and regulators. The Agency agrees with the comment that the report is based on a sample that contains a disproportionate number of tanks that were installed after promulgation of the UST rules in 1988. This may well be because the vast majority of sti-P3® tanks have been installed since 1985, making older sti-P3® tanks and information about them rare. The Agency further agrees with this commenter that without such data, there is not adequate evidence to support any change in the monitoring frequency requirement. The Agency notes that data of this nature may not be available for several years, due to the youth of installed sti-P3® tanks relative to their expected service life *and relative to their current warranty period of 30 years. Even though age is by no means the sole indicator of tank integrity, corrosion is progressive and the Agency believes that the fact that relatively few older tanks were surveyed skews the applicability of the report's findings to the subject of STI's request.*

The Agency acknowledges the report's findings that there have been very few recorded failures of sti-P3® tanks, but acknowledges the commenters who stated that no statistically reliable data was included to affirm the claim that the sti-P3® tank has a very good performance record to date. The Agency again notes the lack of data from older sti-P3® tanks.

The Agency agrees with the comment noting that much of the information in the report is anecdotal, and that many of the people providing the information appear to have little technical knowledge of cathodic protection. The Agency believes that the findings obtained from these sources are therefore less persuasive than if respondents demonstrated a high level of technical competence. The Agency agrees with the comment that the report does have definite limitations, some of which are stated in the report itself. For example, the report notes that the actual numbers of tanks owned or installed by survey participants could be 50% higher or lower; thus, Tillinghast rightfully could not state with reasonable certainty that all instances of external corrosion of sti-P3® tanks were identified, and also could not state with certainty that the instances that were identified involved sti-P3® tanks.

The Agency also agrees with one commenter that the report noted that cathodic protection monitoring is frequently not performed, and therefore any conclusion that sti-P3® tanks do not need to be monitored is questionable. Furthermore, the Agency agrees with this commenter that the tank owners surveyed in the Tillinghast report that were covered by STI's Watchdog program are more likely to know the condition of their cathodic protection systems and to have taken remedial steps in the event of noncompliant readings. Finally, EPA believes that this commenter's assertion that the number of claims against STICO is not a valid indicator of sti-P3® failures is plausible, partly because a large majority of states have funds available for addressing leaks. The Agency cannot speak to the comment regarding honoring claims and alleged contractor negligence.

The Agency acknowledges one commenter's claim of geographical bias, and agrees with this commenter that the Tillinghast report shows that several percent of sti-P3® tanks tested are not shown to meet industry standards for cathodic protection. Regarding the interviews of installers, the Agency agrees with this commenter that the report shows only 11 out of 37 installers interviewed had experience with sti-P3® removals, and believes that information on tank condition at removal is very important with regard to external corrosion.

The Agency agrees with commenters that some of the sources of information in the Tillinghast report are not financially independent of the success of sti-P3® tanks, but also notes that this is true of several of the commenters. The Agency has taken into consideration the apparent interests of those providing information as appropriate.

In response to the anonymous commenter who felt that the only way to know the truth about sti-P3® tanks was to depose all sti-P3® manufacturers under oath and survey all *owners of cathodically protected tanks, the Agency believes that such activities would be very resource intensive and impractical. However, the Agency acknowledges that the more respondents are surveyed, the greater the level of confidence in the responses, and notes that the Tillinghast findings are based on surveys of only a small fraction of the installed sti-P3® tanks.*

The Agency acknowledges the report's findings that almost eight percent of tanks in the Watchdog program in recent years were not shown to be protected for one reason or another, though cathodic protection monitoring results are reported to be improving. The Agency also acknowledges the report's finding that, unless a tank is in the Watchdog program or maintained by a major oil company, cathodic protection monitoring is generally not being performed. The Agency also acknowledges that assessing the frequency of cathodic protection testing was not the primary purpose of the report, and that Tillinghast states that it did not obtain enough corrosion monitoring data to statistically determine an optimum monitoring frequency.

Consideration of the Tillinghast report and comments regarding it lead the Agency to believe that routine cathodic protection monitoring is necessary in determining whether or not steel tanks are protected from external corrosion, and should still be required.

3. Inequality of Rules - Applicability to Other Tanks

Several commenters (Highland Tank & Manufacturing Company #2, Ten Hoeve Brothers, Inc. #1) argue that the monitoring requirement is inappropriate because it is not placed on bare steel tanks and other technologies that are allegedly less proven than the sti-P3® tank.

Several commenters (Xerxes Corporation; Marcel Moreau Associates; State of Michigan, Department of State Police) argue that the cathodic protection monitoring requirement is not inconsistent with the phase-in schedule for existing UST systems. One of these commenters (Marcel Moreau Associates) states that the fact that sti-P3® tanks require cathodic protection monitoring and others do not should not be viewed as unfair. Rather, the fact that different requirements apply to different tanks should be accepted as part of the overall regulatory strategy used to ensure the safety of all UST systems by 1998. The commenter adds that sti-P3® tank distributors could use this argument as a selling point, promoting their tanks as better protected from leaks than are brands that do not have to adhere to the monitoring requirements. Another of these commenters (State of Michigan, Department of State Police) notes that the cathodic protection requirement for steel tanks is not indicative of a bias toward unprotected steel tanks. Rather, the 1998 phase-in of tank upgrade requirements is intended to minimize the financial burden on the regulated community for costs associated with upgrading UST systems. The other commenter (Xerxes Corporation) stated that although the requirements appear to be inequitable with older non-protected tanks, the commenter argues that the customer is paying for a better product when he buys a cathodically protected steel tank.

Several commenters (Xerxes Corporation; Marcel Moreau Associates; State of Michigan, Department of State Police) argue that because periodic monitoring of fiberglass tank diameters is not required is not a valid reason for eliminating the cathodic protection monitoring requirement for steel tanks. The commenters contend that the two types of tanks fail in different ways. Thus, requirements that may be appropriate for steel tanks may not be appropriate for fiberglass tanks. Another commenter (State of Michigan, Department of State Police) argues that, although the absence of tank deflection monitoring requirements for fiberglass-reinforced-plastic tanks supports a lack of tank deflection monitoring requirements for steel tanks, the absence of such a requirement does not justify eliminating the cathodic protection monitoring requirements for steel tanks.

Response

While it is true that cathodic protection monitoring is not required on bare steel tanks prior to December 22, 1998, this fact does not warrant relaxation of the requirements for cathodically protected steel tanks. The Agency believes that the discrepancy in requirements is appropriate. It would have been most environmentally protective to require immediate upgrading of bare steel tanks. However, the Agency still supports its original decision, made when the technical rule was promulgated in 1988, to allow owners of bare steel tanks until 1998 to meet these requirements. This decision was based on the Agency's conclusion that a shorter compliance period was not feasible, given the diverse nature and large size of the *regulated UST community. Because periodic cathodic protection monitoring of steel tanks that do not even have cathodic protection serves no purpose, and because, as stated elsewhere, cathodic protection monitoring is neither difficult nor expensive, the Agency believes that applying different standards is reasonable. Meanwhile, it is important for cathodically protected tanks to be monitored, to ensure that they are indeed protected, and to ensure that they do not add to the threat posed by existing bare steel tanks. The Agency also notes that bare steel tanks must be replaced or upgraded by December 22, 1998. Either of these tasks costs thousands of dollars. By contrast, tanks with pre-engineered cathodic protection monitoring systems (and spill and overfill equipment) need not be upgraded or replaced.*

Although the Agency defined a ten year compliance period for upgrading existing bare steel tank systems, it continues to be concerned about their potential impact on human health and the environment. The Agency notes that it and many state UST programs have encouraged owners and operators to upgrade their existing tank systems before the 1998 deadline and have seen some progress toward that end. Compliance with the monitoring requirements for those upgraded or replaced systems has greatly reduced the incidence of corrosion failure in steel tanks. Given the complex nature and size of the regulated community, the Agency believes that this combination of requirements has provided the greatest protection of human health and the environment.

In response to concerns about the inequality of the rule because it does not apply to fiberglass tanks, the Agency believes that tank wall deflection in fiberglass tanks is a fundamentally different physical phenomenon than external corrosion of steel tanks, both in its nature and in its likelihood to pose a threat to tank integrity over the long term. The materials used to construct different types of tanks vary and the Agency, in the technical standards promulgated in 1988, initially determined specific testing methods and frequency based on the risk posed by those materials. The Agency concedes that coated, cathodically protected steel tanks meeting the UST regulations pose orders of magnitude less risk of failure due to external corrosion than unprotected steel tanks. Nevertheless, the fact remains that steel, if its protection is compromised, is subject to long-term progressive deterioration by way of corrosion in a way that fiberglass-reinforced plastic is not. In the preamble to the proposed technical rule, The Agency noted that corrosion was the major cause of leaks from unprotected steel UST systems. See 52 Fed. Reg. 12666 (1987). The Agency believes that monitoring cathodic protection systems is necessary to ensure that cathodically protected steel systems remain protected, and that they do not in the future pose risks to human health and the environment similar to those the Agency found in the past. In addition, the Agency currently does not have information indicating that fiberglass tanks pose particular risks of failure over the long term or that imposing periodic monitoring of fiberglass tanks, such as deflection monitoring, would reduce risks to human health and the environment. Therefore, the Agency agrees with commenters who argued that the lack of monitoring of deflection in fiberglass tanks is not a valid reason to eliminate or reduce the monitoring requirement on steel tanks.

4. Duplication of Leak Detection Requirements

Several commenters[4] indicated that when properly used or installed, inventory control techniques and leak detection monitors provide notice of tank system failure and effectively reduce chances for spills of any consequence. These commenters stated that the cathodic protection monitoring requirement is redundant in light of these other requirements.

Several commenters (ASTSWMO; Marcel Moreau Associates; NACE International; State of Michigan, Department of State Police; Green Environmental & Corrosion, Inc.; State of Missouri, Department of Natural Resources), however, noted that leak detection monitoring and cathodic protection monitoring do not serve the same purpose. Leak detection monitoring provides notice of releases and environmental damage. Cathodic protection monitoring works as a means of leak prevention by providing notice of potential corrosion which could lead to leaks. These commenters, therefore, disagreed that the two systems are redundant, and argued that leak detection monitoring does not supersede the need for cathodic protection monitoring.

One of these commenters (ASTSWMO) noted that more resources are currently directed toward clean-up than to preventive measures. However, the commenter feels that the Agency's approach to the problem of leaking USTs is essentially correct as it addresses both ends of the tank problem -- using resources as needed to respond to leaks while developing requirements that focus on prevention.

Response

The Agency believes the current cathodic protection system monitoring requirements do not duplicate the leak detection requirements. Leak detection systems are designed to inform owners and operators when a leak in the UST system has already occurred. By contrast, cathodic protection systems are designed to prevent damage to USTs by warning owners and operators that their UST system or piping is no longer adequately protected and has become vulnerable to corrosion. Cathodic protection systems and the requirements for monitoring them are designed to reduce the likelihood that any release will occur and to prevent pollution; leak detection systems help to reduce the likelihood that a leak from an UST system will become significant, but are not designed to reduce the likelihood of a leak.

5. Ease and Costs of Compliance

5.1 Ease of Cathodic Protection Monitoring

One commenter (New York State Department of Environmental Conservation) indicated that it is easy to monitor cathodic protection systems. The commenter noted that once a system has been properly installed that provides access to the soil above the tank, the major problem to be expected is low soil moisture content. This condition can lead to incorrect or incomplete readings. The commenter suggested that this could be corrected by adding water to the soil and taking the reading again.

Another commenter (State of Missouri, Department of Natural Resources) noted that the problem with the current monitoring requirement is that the specified frequency differs from the frequency of other actions required under UST rules. This makes the requirement difficult to remember. Another commenter (Chem Met, Ltd., P.C.) notes that often there is a tendency to forget to monitor the cathodic protection system. The commenter feels that this tendency will become more prevalent if the monitoring schedule is extended.

Another commenter (New York State Department of Environmental Conservation) noted that the Tillinghast report states that many owners and installers do not understand the technical basis for cathodic protection. The commenter responded that a lack of education should not be a reason for eliminating the monitoring requirement. The commenter proposed that more education is needed to help people understand why tanks are protected and how to determine if protection is adequate. One commenter (Xerxes Corporation) notes that the Tillinghast report mentions the need for additional training for installers and customers.

A commenter (Piping and Corrosion Specialties Inc.) states that incorrect testing procedures could lead to inaccurate readings when the cathodic protection system is being monitored. The commenter worries that inaccurate readings may be obtained because the Steel Tank Institute does not have a technical report form which specifies the required location of the test electrode so that it will be in a proper location to avoid direct influence of the anodes on the test reading.

5.2 Cost of Cathodic Protection Testing

One commenter (Fargo Tank Company) noted that tank owners must hire a testing agency at extra cost to test the cathodic protection system, an unnecessarily expensive burden.

Several commenters (Cayuga Onondaga, Board of Cooperative Services; Owens-Corning Fiberglass Corporation; Green Environmental & Corrosion, Inc.) disagreed and stated that the actual costs of testing are minimal. One commenter (Cayuga Onondaga, Board of Cooperative Services) indicated that the cost of testing is approximately $95 per year. This commenter indicated that commercially available hand-held test meters cost $150-$200. The commenter noted that the time required to test either tank or piping is less than five minutes if test leads are available, 10-15 minutes each if a test probe or wire must be touched to the bottom of the tank. The commenter assumed that the cost for a laborer to inspect the tanks would be $20 per hour. The commenter thus calculated a cost of $95 per year for annual testing of a six-tank facility.

Another commenter (Owens-Corning Fiberglass Corporation) cited a report entitled "UST System Installation and Maintenance" by Wayne B. Geyer. The report notes that testing can be done with a simple and inexpensive voltmeter and requires only five minutes every three years.

Another commenter (Green Environmental & Corrosion, Inc.) reports that her firm tests over 300 sti-P3® tank sites per year. Her firm charges $200 per location, but has charged as little as $150 per location for clients with multiple sites. The commenter is aware of other firms that charge as little as $95 per location, which translates into an annual cost of $32 to $67 per location.

Another commenter (Northeast Utilities Service Company) states that the annual cost of cathodic protection monitoring is between $130 and $500. The commenter further states that in the past four years his company has experienced 27 releases, costing a total of over $4 million, an average of $150,000 per release. The commenter concludes that the cost/benefits analysis suggests that cathodic protection monitoring should be retained in some form. Two other commenters (Piping & Corrosion Specialties Inc.; ASTSWMO) report that the current monitoring requirement is a very inexpensive and cost-effective policy to prevent tank leaks and the high cost of remediating those leaks.

5.3 Costs of Cathodic Protection Monitoring Systems Affects Consumer Choices

One commenter (Brown-Minneapolis Tank) states that it will cost the industry billions of dollars to monitor sti-P3® tanks. Furthermore, the cost of monitoring an sti-P3® tank places this technology at an unfair disadvantage with other technologies that do not have a monitoring requirement, some of which have higher failure rates than sti-P3® tanks.[5]

Several commenters[6] indicate that when they inform their customers of the monitoring requirement for sti-P3® tanks, the customers choose other tanks -- including those that use experimental technologies with unproven track records -- because they do not want the burden of complying with the monitoring requirement. One commenter (Highland Tank & Manufacturing Company #3) reported that in order to remain competitive, his company is being forced to sell products without the proven cathodic protection system, a technology that most customers would prefer to have but are unwilling to purchase because of the monitoring requirement.

Another commenter (Highland Tank & Manufacturing Company #7) states that the regulations hurt sales of sti-P3® tanks because competitors have waged a marketing campaign stressing concern about the safety of sti-P3® tanks and implying that such concerns do not exist for the competition's tank. The commenter states that competitors use scare tactics to dissuade consumers from buying sti-P3® tanks. Competitors emphasize that the sti-P3® tank requires periodic monitoring and that if the monitoring is not performed and records are not kept, the owner can be fined $10,000 a day. These claims put the sti-P3® tank at a competitive disadvantage.

One commenter (Letter to David Ziegele from Anonymous) notes the steel tank industry is currently under great pressure to be profitable as well as competitive. The commenter reports that privately, many companies oppose eliminating the monitoring requirement for single-walled steel tanks. While some companies do not want to manufacture single-walled USTs for reasons of liability, the commenter feels that companies will be forced to manufacture such products in order to remain competitive should the monitoring requirement be rescinded.

One commenter (Xerxes Corporation) states that, based on experience, sti-P3® tanks, particularly single wall versions, are priced competitively with other tanks. The commenter indicates that the added cost of the monitoring requirement does not make sti-P3® tanks uncompetitive with competing brands.

Another commenter (State of Michigan, Department of State Police) notes that the Tillinghast report indicates that owners are choosing aboveground tanks. This contradicts the Steel Tank Institute's claim that owners are choosing other underground systems because they feel that the monitoring requirement is a nuisance.

Another commenter (Marcel Moreau Associates) notes that if consumers consider monitoring to be a nuisance and choose other tanks it is simply a fact of life in a capitalist economy that should not be used as a justification for eliminating the monitoring requirement. The commenter strongly expresses his opinion that monitoring is a standard practice for a tank with a cathodic protection system. If a consumer wants to have a tank with a cathodic protection system, it is reasonable to require that the system be operated properly. This commenter also acknowledges that monitoring the cathodic protection system costs money, but states that the practice is essential to the proper operation of an sti-P3® tank. He argues that if one cannot afford to operate an sti-P3® tank in the manner that it should be operated, one should consider using a different technology. He states that if the Steel Tank Institute thinks that the cost of monitoring is causing the sti-P3® tank to be viewed as a non-viable technology in today's marketplace, it is the result of the natural workings of the free market.

One commenter (Xerxes Corporation) feels that the fact that the monitoring requirement is affecting buyers' choices is not a special case. The commenter implies that every tank has characteristics which buyers like or dislike, and their choices will be affected by those consumer tastes and the availability of other products on the market.

Another commenter (Green Environmental & Corrosion, Inc.) contends that when considering whether to modify the current monitoring requirement, the opinions of the engineering community should far outweigh that of an economically affected provider. The commenter reports that the claims made by Steel Tank Institute are based on economics rather than on engineering principles.

Response

The Agency agrees with commenters who stated that cathodic protection monitoring is easy to perform and relatively inexpensive. Problems commonly reported with monitoring, such as incorrect readings caused by low soil moisture content, often can be rectified by relatively simple means, such as adding water to the soil and taking the reading again. The Agency agrees with the commenter who stated that a lack of understanding of cathodic protection on the part of owners and installers should not be a reason for eliminating the monitoring requirement, and, instead, better understanding is what is needed. The Agency acknowledges the comment that the Tillinghast report mentions the need for more training for UST installers and operators. The Agency acknowledges the comment that incorrect testing procedures could lead to inaccurate cathodic protection readings. However, the Agency believes that the UST regulatory requirements for testing act to ensure that incorrect testing does not pose undue risks. For example, the fact that monitoring must be repeated periodically reduces the risk that a single inaccurate reading may be relied on for many years. The comments overall support the conclusion, also expressed in a report by STI, that the cost of monitoring is minimal and that it is easy.

Other commenters provided data showing that cathodic protection monitoring is relatively inexpensive, ranging from $95 to $200 per typical location with three USTs. The monitoring is inexpensive relative to many other expenses involved in installing and operating USTs. The Agency understands that a typical three-tank retail fuel marketing facility costs over $100,000 to construct. In addition, the monitoring is inexpensive in terms of both time and money relative to the costs to both the private and public sector of the consequences of a leak, which could result from several causes, including insufficient tank corrosion protection. There have been over 250,000 confirmed releases; sites with only soil contamination often cost tens of thousands of dollars to address; remediation of contaminated groundwater sites typically cost over $100,000. The Agency believes that the costs of monitoring are reasonable and do not place an unnecessary financial burden on owners and operators.

In response to concerns that the costs of cathodic protection monitoring affect consumer choices, the Agency acknowledges that this argument may be plausible, but believes it is one of several factors that have lead to changes in the market shares for various tank technologies over the past few years. In response to the commenters who indicated that customers sometimes choose other technologies without proven track records to avoid the monitoring burden, the Agency believes that all the technologies allowed in the final technical rule (40 CFR 280.20) are protective of human health and the environment. These technologies include corrosion protected steel, fiberglass-reinforced plastic, steel clad with fiberglass-reinforced plastic, and, for sites meeting certain requirements, steel without additional corrosion protection.

6. Failure to Enforce the Cathodic Protection Monitoring Requirement Is Not a Justification to Relax the Frequency of the Requirement

One commenter (New York State Department of Environmental Conservation) noted that the Tillinghast report states that enforcement of the monitoring requirement is not a high priority with federal and state inspectors. The commenter argues that the current lack of enforcement of the monitoring requirement does not reduce the need for monitoring. The commenter states that if in the future leaks are detected from USTs because the tanks did not remain corrosion resistant, the issue of compliance with the cathodic protection monitoring requirements will become much more important.

Another commenter (Marcel Moreau Associates) notes that corrosion protection enforcement has not been a priority in many states because resources are being applied to more immediate problems such as leaks and existing contamination. The commenter has noticed great interest in corrosion protection among state regulatory personnel. The commenter notes that he has conducted or is scheduled to conduct corrosion protection training for regulatory personnel in thirteen states.

Another commenter (State of Michigan, Department of State Police) notes that the Steel Tank Institute reports that since enforcement efforts are directed at cleanup and leak detection, cathodic protection monitoring is not an essential activity in the UST program. This commenter responds that states determine program priorities based on a variety of factors, and that these priorities are not necessarily an indication of the overall value of cathodic protection monitoring. Another commenter (Xerxes Corporation) indicates that although the cathodic protection monitoring requirement is not being enforced, it is still considered a priority. The commenter suggests that enforcement of the requirement will occur after 1998, the regulatory deadline for all tanks to be corrosion protected.

6.1 Enforcement of the Monitoring Requirement Would Enhance Owners' and Operators' Ability to Comply with the Requirement

One commenter (Cayuga/Onondaga Board of Cooperative Services) observed poor compliance with the cathodic protection monitoring requirement. This commenter, with more than eight years of experience in tank testing and installation involving nearly 100 sti-P3® tanks, specifically noted that the required cathodic protection testing data was on file with owners and operators in only about 2-3% of the cases with which he had been involved. Data were not available for a variety of reasons. Steel piping was inaccessible, lacked protective cathodic coatings, or did not have anodes attached. Some tanks had anodes that were still covered by plastic coverings on inspection following installation. The commenter also noted that fewer than 50% of the tank installations he observed provided test leads accessible for test metering. The commenter concludes that since there is a small number of accessible, cathodically protected piping installations, the cathodic protection monitoring regulations, both state and federal, appear unfeasible.

Response

While the Agency acknowledges that enforcement priorities may vary among states, the extent of current enforcement activity does not determine the need for the frequency of monitoring cathodic protection systems. The Agency believes that cathodic protection monitoring is an important component of prevention activities for UST owners and operators. Cathodic protection monitoring is important because it is a relatively inexpensive preventive measure owners and operators can take to ensure they do not have equipment susceptible to external corrosion and the resulting product loss. The Agency also notes that the UST regulations require less frequent cathodic protection monitoring than do other federal regulations promulgated by EPA (40 CFR 264.195) and the Department of Transportation (49 CFR 192.455 to 192.477, Appendix D). The Agency does not believe the UST monitoring requirements are unnecessarily burdensome.

The Agency acknowledges that in many states, enforcement of the leak detection requirements have been given priority over cathodic protection monitoring requirements because of the earlier leak detection compliance deadlines. However, the Agency agrees with the comment that, with the upcoming 1998 compliance deadline for corrosion protection of all regulated USTs, emphasis will most likely shift to include more vigorous enforcement of the cathodic protection monitoring requirements. This is because compliance with the 1998 deadline is very important in protecting the environment, and because enforcement can be more straightforward and uniform at that time, since there will be no question as to whether an UST must meet the requirements.

In response to the commenter who stated that since there are many tanks without test leads accessible for testing, the Agency notes that, while test leads make monitoring easier, they are not necessary for testers to make the needed electrical contacts.

7. Miscellaneous Issues

One commenter (KCL Projects Ltd.) expressed concern that the sti-P3® system has no means of protection against internal corrosion. This commenter suggested that the Agency ask Tillinghast to provide data relating to the effectiveness of the sti-P3® tank at preventing leaks due to internal corrosion.

One commenter (Fond du Lac County, Office of the County Highway Commission) misunderstood the solicitation for comments, and argued that the Agency should not impose stricter standards on sti-P3® tanks by requiring that those tanks be removed and upgraded with new cathodic protection devices.

One commenter (Corrosion Control Specialist, Inc.) stated that the Agency and NACE need to clarify that the qualifications for a corrosion engineer which are stated in 40 CFR Section 280.12 should not be interpreted too liberally. Specifically, clarification should focus on distinguishing between the different levels of NACE certifications.

Another commenter (AT&T) states that the Agency needs to formalize it's position regarding cathodic protection testing of double wall USTs, and that the position be included in any amendments to the cathodic protection requirements of the UST regulations. The commenter says that currently the Agency's position is that the UST regulations do not require testing of double wall steel USTs, but that state and local regulatory agencies that promulgate and enforce UST regulations may not be aware of the Agency's position. This position was delineated in a letter dated July 18, 1991 from David O'Brien of the Agency to Charles A. Frey of Highland Tank & Manufacturing Company. The commenter states that the RCRA Hotline and OUST refer to this letter as a statement of the Agency's position.

One commenter (Fiberglass Petroleum Tank & Piping Institute) states that sti-P3® tanks do not qualify to be sold under the Underwriters Laboratories label. The commenter notes that the Steel Tank Institute alludes to compliance with the UL standard in their advertisements because they say, "built to nationally recognized Steel Tank Institute and Underwriters Laboratories standards." This commenter asks the Agency to recognize that the Steel Tank Institute advertisements, despite their reference to UL, should not be assumed to convey approval of the sti-P3® tank by Underwriters Laboratory.

Response

In general, the Agency acknowledges these comments but does not believe they are directly relevant to the issues addressed by the Notice of Data Availability, nor do they provide specific data that can be used in evaluating the appropriateness of the current cathodic protection monitoring requirement. The Agency, however, appreciates these comments and has given them due consideration in its decisionmaking process.

In response to the comment regarding internal corrosion, the Agency notes that its current inquiry is limited to STI's request to relax the monitoring requirements, the Tillinghast report, and the Notice of Data Availability, which all focus on external corrosion. In any event, *the Agency's information is that internal corrosion of steel tanks historically poses a much smaller risk of release than does external corrosion.*

The comment concerning removal of sti-P3® tanks is not relevant because cathodic protection monitoring applies only to installed tanks. The cathodic protection requirement has no direct relation to tank removal.

The comment regarding the UST regulations, corrosion engineer qualifications, and NACE International certification levels is not within the scope of STI's request to relax the monitoring requirements, the Tillinghast report, or the Notice of Data Availability. In any event, the Agency is reviewing these subjects in a separate activity and acknowledges this comment.

The Agency acknowledges the comment regarding cathodic protection monitoring of double wall cathodically protected steel USTs. However, the Agency's Notice of Data Availability spoke to single wall cathodically protected tanks, and the Agency believes it is this type of tank which is most crucial to monitor for cathodic protection.

In response to the comment about the compliance of sti-P3® tanks with Underwriters Laboratories (UL) standards and about STI advertisements, the Agency notes that this comment is not within the scope of the current discussion. Instead, this is a matter more appropriately pursued with STI and/or with UL.

ENDNOTES

1. John W. Kennedy Company, Inc. #1; JEMKO Petroleum Equipment, Inc.; Oil Equipment Sales, Inc.; Northeast Mechanical Corporation; EnviroReps, Inc.; Advanced Pollution Control; Parker & Associates, Inc.; Fedco Tank and Equipment, Inc.; John W. Kennedy Company, Inc. #2; Pet-Chem Equipment Corp.; Gould Equipment Company; Whitelock and Woerth, Inc.; Francis Smith & Sons, Inc.; J.M.A. Associates, Inc.; Engineered Equipment Sales Inc.; Quality Petroleum Systems, Inc.; Hirri Service Company; Professional Petroleum Service Company; TJ Equipment Company; James B. Phillips Company, Inc.; Trombold Equipment Company; Young Equipment Division; D.T. O'Connor, Inc.; Meter & Tank Equipment Company, Inc. #1; Meter & Tank Equipment Company, Inc. #2; Meter & Tank Equipment Company, Inc. #3; Samuel K. Spigler Company, Inc.; Highland Tank & Manufacturing Company #9; Sammie Huff Contractors, Inc., Gilarco Sales & Service; Ten Hoeve Brothers, Inc. #2; Ten Hoeve Brothers, Inc. #3; Jon El, Inc., Mechanical Equipment Sales; NECO Equipment Company; Allan U. Bevier, Inc.; Tate Instrumentation & Controls

2. These commenters misinterpreted the total failure rate provided for the 591 tanks in the Geyer Report. The actual failure rate cited in the Geyer Report is 10%.

3. Highland Tank & Manufacturing Company #1; Highland Tank & Manufacturing Company #2; Luther P. Miller, Inc.; Toot-N-Scoot: A Division of Best Oil Inc.; Boulder Oil Company; Dean Fowler Oil Company; Lou Korchak Oil Company, Inc.; John W. Kennedy Company, Inc. #1; Emmart Oil Company; Enercon Services, Inc.; Highland Tank & Manufacturing Company #3; Midstate Fuel Storage Systems; Interface Services, Inc. #1; Alaskan Oil; Clemett & Company; Interface Services, Inc. #2; JEMKO Petroleum Equipment, Inc.; Earl "Jerry" Galvin Manufacturers Representative; Environmental & Energy Systems Company #1; Carlucci Construction Company, Inc.; Environmental & Energy Systems Company #2; Oil Equipment Sales, Inc.; Fedco Manufacturing Corporation; JABE Construction & Equipment Inc.; Barkman Oil Company Inc.; Environmental & Energy Systems Company #3; Miller's Petroleum Systems, Inc.; Tiger Fuel Company; H.J. Tanner, Inc.; Northeast Mechanical Corporation; Glider Oil Company; EnviroReps, Inc.; HOBBS Inc. #1; Advanced Pollution Control; HOBBS Inc. #2; Parker & Associates, Inc.; Fedco Petroleum Installations, Inc.; Kelley Omega, Inc.; Fedco Tank and Equipment, Inc.; Center Point Tank Services, Inc.; C & S Contractors & Equipment, Inc.; Mon Valley Petroleum Company; Northrup Supply Corp.; Environmental & Energy Systems Company #4; J & J Marts, Inc., Mountaineer Mart; Gary Dyer Excavating Company, Inc.; Purvis Brothers, Inc.; Everybody's Oil Corporation; Alaskan Oil Inc.; International Association of Tank Testing Professionals; Coldiron Fuel, Inc.; Griffith Oil Company; C. Arlo Cummins; John W. Kennedy Company, Inc. #2; Bettiol Fuel Service, Inc.; Ravenna Oil Company; Pet-Chem Equipment Corp.; Leake Oil Company; Cuyahoga Landmark Petroleum Services; Varouh Oil, Inc.; The Lyden Company; Cross Oil Corporation; Highland Tank & Manufacturing Company #4; Gould Equipment Company; Beaver Petroleum Co. Inc.; M&M Oil Company, Inc.; The Coen Company; Petroleum Equipment Services, Inc.; James A. Grogey; Worth & Company, Inc.; A. Graziani & Company, Inc.; Highland Tank & Manufacturing Company #5; Whitelock and Woerth, Inc.; McKenzie Group, Inc.; Voegele Mechanical, Inc.; Francis Smith & Sons, Inc.; J.M.A. Associates, Inc.; Engineered Equipment Sales Inc.; Joseph Stong, Inc.; Quality Petroleum Systems, Inc.; Beck Suppliers, Inc; Lechmanik, Inc.; Ward's Pump and Tank; Edward J. Meloney, Inc.; Valley Equipment Company, Inc. #1; Grace Oil Company; Republic Oil Company, Inc.; Valley Equipment Company, Inc. #2; Humb Remodeling & Equipment; Jack Hirsch; Hirri Service Company; Black Equipment, Inc.; Professional Petroleum Service

Company; TJ Equipment Company; James B. Phillips Company, Inc.; United Environmental Group Inc.; Fedco Tank & Equipment, Inc.; Cernak Tank Company, Inc.; United Marketing, United Refining Company of Pennsylvania; Petro Tech Electronics Inc.; Trombold Equipment Company; G.E. Sell, Inc.; Steven J. Tornabine; Crawford Fuel & Oil; Holmes Oil Company; Young Equipment Division; Marshall Farms, Inc.; M&E Anderson Equipment & Testing; Laurel Valley Oil Company; E.E. Wine, Inc.; Rice Christ, Inc. #1; Rice Christ, Inc. #2; Rice Christ, Inc. #3; Eastern Petroleum Services, Inc.; Ullman Oil, Inc.; Carl Mundy Contractors #1; James Nichols; Tri-State Petroleum Corporation #1; Petroleum Services, Inc.; Ten Hoeve Brothers, Inc. #1; Carl Mundy Contractors #2; Kay Bibih; Tess Bechtold; D.T. O'Connor, Inc.; Penzoil Products Company; Carl Mundy Contractors #3; Joe DeFazio Oil Company; Childers Oil Company; J.H. Crosier Company; Bell Petroleum Ltd., Aviation Products Division #1; Fred's Plumbing and Heating #1; Fred's Plumbing and Heating #2; Sammy L. Throlup; Benit Fuel Sales & Service Inc. #1; Highland Tank & Manufacturing Company #6; Benit Fuel Sales & Service Inc. #2; Bell Petroleum Ltd., Aviation Products Division #2; Highland Tank & Manufacturing Company #7; Herman Goldner Company, Inc.; A.C. & T. Company, Inc.; Caledonia Oil Company #1; Caledonia Oil Company #2; Mountain State Bit Service, Inc.; SICO Company; Caledonia Oil Company #3; Meter & Tank Equipment Company, Inc. #1; Meter & Tank Equipment Company, Inc. #2; Meter & Tank Equipment Company, Inc. #3; Samuel K. Spigler Company, Inc.; Highland Tank & Manufacturing Company #8; Highland Tank & Manufacturing Company #9; Alliance Oil Service Company; Cortland Pump & Equipment Company; Bedford Valley Petroleum Corporation; Coastal Pump & Tank, Inc.; First State Petroleum Services, Inc. #1; Willison Oil, Inc.; Petroleum Industry Consultants, Inc.; Tri-State Petroleum Corporation #2; Sammie Huff Contractors, Inc., Gilarco Sales & Service; Ten Hoeve Brothers, Inc. #2; Ten Hoeve Brothers, Inc. #3; Jon El, Inc., Mechanical Equipment Sales; Lane & Clark Mechanical Contractors, Inc.; Craig K. William; Joseph Goffrey; Oil Equipment Sales & Service Company, Inc. (OESSCO); APCON Environmental Services, Inc.; Franklin Oil Company, Inc. #1; Baird Petroleum Equipment Corporation; Harris Oil Company, Inc.; Emmart Oil; Highland Tank & Manufacturing Company #11; James Islintu; R.L. Smiltz Oil Company, Inc.; Albright Oil, Inc.; Howard Gasoline & Oil Company; Shelving Installation Service, Inc.; First State Petroleum Services, Inc. #2; K & T Pump & Tank, Inc.; DePue Oil Company; NECO Equipment Company; Franklin Oil Company, Inc. #2; Allan U. Bevier, Inc.; Highland Tank & Manufacturing Company #12; Charles A. Frey; Oil Repair & Installation Company, Inc.; Delmarva Tank Specialists, Inc.; Smiles Are For Free - Everything Else is C.O.D.; Highland Tank & Manufacturing Company #13; Richard D. Galli; Goode Omega, Inc.; Tate Instrumentation & Controls

4. Fargo Tank Company; Highland Tank & Manufacturing Company #1; Luther P. Miller, Inc.; Toot-N-Scoot: A Division of Best Oil Inc.; Boulder Oil Company; Dean Fowler Oil Company; Lou Korchak Oil Company, Inc.; John W. Kennedy Company, Inc. #1; Emmart Oil Company; Enercon Services, Inc.; Midstate Fuel Storage Systems; Interface Services, Inc. #1; Alaskan Oil; Clemett & Company; Interface Services, Inc. #2; JEMKO Petroleum Equipment, Inc.; Earl "Jerry" Galvin Manufacturers Representative; Environmental & Energy Systems Company #1; Carlucci Construction Company, Inc.; Environmental & Energy Systems Company #2; Oil Equipment Sales, Inc.; Fedco Manufacturing Corporation; JABE Construction & Equipment Inc.; Barkman Oil Company Inc.; Environmental & Energy Systems Company #3; Miller's Petroleum Systems, Inc.; Tiger Fuel Company; H.J. Tanner, Inc.; Northeast Mechanical Corporation; Glider Oil Company; EnviroReps, Inc.; HOBBS Inc. #1; Advanced Pollution Control; HOBBS Inc. #2; Parker & Associates, Inc.; Fedco Petroleum Installations, Inc.; Kelley

Omega, Inc.; Fedco Tank and Equipment, Inc.s; Center Point Tank Services, Inc.; C & S Contractors & Equipment, Inc.; Mon Valley Petroleum Company; Northrup Supply Corp.; Environmental & Energy Systems Company #4; J & J Marts, Inc. Mountaineer Mart; Gary Dyer Excavating Company, Inc.; Purvis Brothers, Inc.; Everybody's Oil Corporation; Alaskan Oil Inc.; Coldiron Fuel, Inc.; Griffith Oil Company; C. Arlo Cummins; John W. Kennedy Company, Inc. #2; Bettiol Fuel Service, Inc.; Ravenna Oil Company; Pet-Chem Equipment Corp.; Leake Oil Company; Cuyahoga Landmark Petroleum Services; Varouh Oil, Inc.; The Lyden Company; Cross Oil Corporation; Highland Tank & Manufacturing Company #4; Gould Equipment Company; Beaver Petroleum Co. Inc.; M&M Oil Company, Inc.; The Coen Company; Petroleum Equipment Services, Inc.; James A. Grogey; Worth & Company, Inc.; A. Graziani & Company, Inc.; Highland Tank & Manufacturing Company #5; Whitelock and Woerth, Inc.; McKenzie Group, Inc.; Voegele Mechanical, Inc.; Francis Smith & Sons, Inc.; J.M.A. Associates, Inc.; Joseph Stong, Inc.; Quality Petroleum Systems, Inc.; Beck Suppliers, Inc; Lechmanik, Inc.; Ward's Pump and Tank; Edward J. Meloney, Inc.; Valley Equipment Company, Inc. #1; Grace Oil Company; Republic Oil Company, Inc.; Valley Equipment Company, Inc. #2; Humb Remodeling & Equipment; Jack Hirsch; Hirri Service Company; Black Equipment, Inc.; Professional Petroleum Service Company; TJ Equipment Company; United Environmental Group Inc.; Cernak Tank Company, Inc.; United Marketing, United Refining Company of Pennsylvania; Petro Tech Electronics Inc.; Trombold Equipment Company; G.E. Sell, Inc.; Steven J. Tornabine; Crawford Fuel & Oil; Holmes Oil Company; Young Equipment Division; Marshall Farms, Inc.; M&E Anderson Equipment & Testing; Laurel Valley Oil Company; E.E. Wine, Inc.; Rice Christ, Inc. #1; Rice Christ, Inc. #2; Rice Christ, Inc. #3; Eastern Petroleum Services, Inc.; Ullman Oil, Inc.; Carl Mundy Contractors #1; James Nichols; Tri-State Petroleum Corporation #1; Petroleum Services, Inc.; Ten Hoeve Brothers, Inc. #1; Carl Mundy Contractors #2; Kay Bibih; Tess Bechtold; D.T. O'Connor, Inc.; Penzoil Products Company; Carl Mundy Contractors #3; Joe DeFazio Oil Company; Childers Oil Company; J.H. Crosier Company; Highland Tank & Manufacturing Company #6; Benit Fuel Sales & Service Inc. #2; Bell Petroleum Ltd., Aviation Products Division #2; Highland Tank & Manufacturing Company #7; Herman Goldner Company, Inc.; A.C. & T. Company, Inc.; Caledonia Oil Company #1; Caledonia Oil Company #2; Mountain State Bit Service, Inc.; SICO Company; Caledonia Oil Company #3; Meter & Tank Equipment Company, Inc. #1; Meter & Tank Equipment Company, Inc. #2; Meter & Tank Equipment Company, Inc. #3; Samuel K. Spigler Company, Inc.; Highland Tank & Manufacturing Company #9; Alliance Oil Service Company; Cortland Pump & Equipment Company; Bedford Valley Petroleum Corporation; Coastal Pump & Tank, Inc.; First State Petroleum Services, Inc. #1; Willison Oil, Inc.; Petroleum Industry Consultants, Inc.; Tri-State Petroleum Corporation #2; Sammie Huff Contractors, Inc. Gilarco Sales & Service; Ten Hoeve Brothers, Inc. #2; Ten Hoeve Brothers, Inc. #3; Jon El, Inc., Mechanical Equipment Sales; Lane & Clark Mechanical Contractors, Inc.; Craig K. William; Joseph Goffrey; Oil Equipment Sales & Service Company, Inc. (OESSCO); APCON Environmental Services, Inc.; Franklin Oil Company, Inc. #1; Harris Oil Company, Inc.; Emmart Oil; Highland Tank & Manufacturing Company #11; R.L. Smiltz Oil Company, Inc.; Albright Oil, Inc.; Howard Gasoline & Oil Company; Shelving Installation Service, Inc.; First State Petroleum Services, Inc. #2; K & T Pump & Tank, Inc.; DePue Oil Company; NECO Equipment Company; Franklin Oil Company, Inc. #2; Allan U. Bevier, Inc.; Charles A. Frey; Oil Repair & Installation Company, Inc.; Delmarva Tank Specialists, Inc.; Smiles Are For Free - Everything Else is C.O.D.; Highland Tank & Manufacturing Company #13; Richard D. Galli; Goode Omega, Inc.; Tate Instrumentation & Controls

5. This commenter supports monitoring of the cathodic protection system immediately following installation an excavation disturbances or retrofit activities.

6. Fargo Tank Company; Highland Tank & Manufacturing Company #2; John W. Kennedy Company, Inc. #1; Highland Tank & Manufacturing Company #3; JEMKO Petroleum Equipment, Inc.; Oil Equipment Sales, Inc.; Northeast Mechanical Corporation; EnviroReps, Inc.; Advanced Pollution Control; Parker & Associates, Inc.; Fedco Tank and Equipment, Inc.; John W. Kennedy Company, Inc. #2; Pet-Chem Equipment Corp.; Highland Tank & Manufacturing Company #4; Gould Equipment Company; Beaver Petroleum Co. Inc.; Highland Tank & Manufacturing Company #5; Francis Smith & Sons, Inc.; J.M.A. Associates, Inc.; Engineered Equipment Sales Inc.; Quality Petroleum Systems, Inc.; Hirri Service Company; Professional Petroleum Service Company; TJ Equipment Company; James B. Phillips Company, Inc.; Trombold Equipment Company; Crawford Fuel & Oil; Young Equipment Division; Ten Hoeve Brothers, Inc. #1; D.T. O'Connor, Inc.; Bell Petroleum Ltd., Aviation Products Division #1; Fred's Plumbing and Heating #1; Fred's Plumbing and Heating #2; Sammy L. Throlup; Benit Fuel Sales & Service Inc. #1; Highland Tank & Manufacturing Company #7; Meter & Tank Equipment Company, Inc. #1; Meter & Tank Equipment Company, Inc. #2; Meter & Tank Equipment Company, Inc. #3; Samuel K. Spigler Company, Inc.; Highland Tank & Manufacturing Company #9; Sammie Huff Contractors, Inc., Gilarco Sales & Service; Ten Hoeve Brothers, Inc. #2; Ten Hoeve Brothers, Inc. #3; Jon El, Inc., Mechanical Equipment Sales; Baird Petroleum Equipment Corporation; James Islintu; NECO Equipment Company; Allan U. Bevier, Inc.; Charles A. Frey; Tate Instrumentation & Controls

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

DEC 4 1995

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Technical Interpretation and Guidance Regarding the Combination of Cathodic Protection and Internal Lining

FROM: Lisa Lund, Acting Director
Office of Underground Storage Tanks

TO: EPA UST/LUST Regional Program Managers
State UST Program Managers

In response to questions from Regions 1, 4 and 7, the Office of Underground Storage Tanks (OUST) is providing a technical interpretation and guidance regarding the upgrade option listed in 40 CFR §280.21(b)(3), internal lining combined with cathodic protection for steel underground storage tanks (USTs). OUST believes that this regulation intended that owners/operators use this upgrade option by adding cathodic protection and internal lining at the same time. However, we understand that this regulation can be interpreted to mean that cathodic protection and internal lining may be added at different times. Therefore, the following three scenarios can occur:

1) the application of an internal lining and cathodic protection at the same time.

2) the addition of cathodic protection to an UST with an internal lining.

3) the application of an internal lining to an UST with cathodic protection.

In all three scenarios, the regulations are clear on the following points. First, the codes of practice for internally lining USTs listed in the note following § 280.21 (b) require that an internal inspection of the tank be conducted prior to application of the lining. [1] Second, an interior lining must be installed in accordance with the requirements of **§** 280.33 (See § 280.21 (b)(3)(i)). Finally, all cathodic protection systems must meet the requirements of § 280.20 (a)(2)(ii), (iii), and (iv), which includes the requirement that these systems be operated and maintained pursuant to § 280.31 (See § 280.21 (b)(3)(ii)). This last point means that cathodic protection systems must be subjected to periodic monitoring to ensure they are working properly and protecting the UST even though the tank has been properly lined.

The following discussion addresses each scenario in greater detail.

Scenario 1:

If an owner/operator chooses to upgrade a steel UST by the addition of cathodic protection and internal lining **at the same time**, then the integrity of the tank must be assessed by internal inspection and found to be structurally sound, followed by proper application of the internal lining and the addition of cathodic protection. The codes of practice for internally lining USTs listed in the note following § 280.21 (b) require that an internal inspection of the tank be conducted prior to application of the lining. In addition, the interior lining must be installed in accordance with the requirements of § 280.33. According to the preamble to the final rule for the UST technical requirements (see 53 Fed. Reg. 37131 [Sept. 23, 1988]), EPA's intent was that if owners and operators were to use interior lining as the sole method for meeting the corrosion protection upgrade, the tank must undergo periodic internal inspections as required by § 280.21 (b)(1)(ii). When combining the two corrosion protection methods, internal lining is no longer the sole method used for meeting the corrosion protection upgrade and, therefore, periodic inspection of the lining is not required. However, the cathodic protection system must be operated and maintained pursuant to § 280.31.

Scenario 2:

The codes of practice listed in the regulations are (1) American Petroleum Institute Publication 1631, "Recommended Practice for the Interior Lining of Existing Steel Underground Storage Tanks," and (2) National Leak Prevention Association Standard 631, "Spill Prevention, Minimum 10 Year Life Extension of Existing Steel Underground Tanks by Lining Without the Addition of Cathodic Protection."

If an owner/operator adds cathodic protection to a **previously internally-lined tank**, then in order not to be required to perform periodic internal inspections of the lined tank, the following must be done. Prior to the addition of cathodic protection, the integrity of the UST must be ensured pursuant to § 280.21 (b)(2). The method of integrity assessment must ensure the integrity of the UST, not just the lining. Once installed, the cathodic protection system must be operated and maintained in accordance with § 280.31. If the above criteria are used, then internal lining is no longer considered the sole method of corrosion protection upgrade and periodic inspection of the lining is not required. If, however, cathodic protection is added to an UST whose integrity was not ensured, then periodic monitoring/inspection of both the cathodic protection system and lining is required.

Regarding the integrity assessment set forth in § 280.21 (b)(2), OUST recommends that an acceptable method of ensuring the tank's integrity is to have a corrosion expert (defined in § 280.11) determine that the UST is structurally sound and free of corrosion holes. The owner/operator should maintain a record regarding this determination for the operating life of the UST. If a cathodic protection system is added to a lined tank using the above criteria, OUST recommends that the lined tank no longer require periodic inspection of the lining. The cathodic protection system must be operated and maintained in accordance with § 280.31. This recommendation is consistent with § 280.20 (a)(4) and (b)(3), standards for new UST systems, which allow a corrosion expert to make the determination regarding corrosion protection, provided that records are kept for the life of the tank.

Scenario 3:

If an owner/operator adds an internal lining to an UST **already having cathodic protection**, then the codes of practice for internally lining USTs listed in the note following § 280.21 (b) require that an internal inspection of the tank be conducted prior to application of the lining. In addition, the interior lining must be installed in accordance with the requirements of § 280.33. Since the interior lining is not the sole method for meeting the corrosion protection upgrade, periodic inspections of the lined tank are not required. However, because of the language in § 280.21 (b)(3)(ii), the cathodic protection system must continue to be operated and maintained in accordance with § 280.31.

If you have any questions regarding this technical interpretation and guidance, please call Paul Miller of my staff at (703) 308-7242.

cc: ASTSWMO UST Task Force
OUST Management Team
OUST Desk Officers
Larry Brill, Region 1
Stanley Siegel, Region 2
Maria Vickers, Region 3
Mary Kay Lynch, Region 4
Willie Harris, Region 5
Willie Kelley, Region 6
Bill Pedicino, Region 7
Stephen Tuber, Region 8
Laura Yoshii, Region 9
Lauris Davies, Region 10
Kathy Nam, OGC
Randy Nelson, Region 7
Joan Olmstead, OECA
Shonee Clark, OUST (Compendium)
Paul Miller, OUST
Joe Lehmann, Subcon, Inc.
James Bushman, Bushman & Associates, Inc.
Michael Baach, Corrpro Companies, Inc.
Jay Lehr, Environmental Education Enterprises, Inc.
James Lary, Harco Technologies Corp.
Ray Kashmiri, ILFC, Inc.
Marcel Moreau, Marcel Moreau Associates
Mary Fitzgerald, NACE International
Shelley Nadel, NACE International
Alex Ralston, Petcon, Inc.
John Piazza II, Southern Cathodic Protection
Jack Quigley, University of Wisconsin
E. David Daugherty, University of Tennessee-Chattanooga

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

May 18 1995

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Guidance on Use of ASTM's Emergency Standard for Alternative Procedures for the Assessment of Buried Steel Tanks Prior to the Addition of Cathodic Protection (ES 40 - 94)

FROM: Lisa C. Lund, Acting Director
Office of Underground Storage Tanks

TO: State UST Contacts
UST/LUST Regional Program Managers
UST/LUST ORC Attorneys
Dawn Messier, OGC
Joan Olmstead, OECA

The purpose of this memorandum is to provide the subject guidance to implementing agencies. EPA recommends that implementing agencies determine that the methods described in a new industry consensus standard for ensuring the integrity of buried steel tanks prior to upgrading with cathodic protection, when combined with certain monthly monitoring, prevents releases in a manner that is no less protective of human health and the environment than methods specifically identified in the Federal underground storage tank (UST) upgrading standards. Upon such a determination, this combination method may be used to meet 40 CFR § 280.21(b)(2)'s requirement that tank integrity be ensured prior to upgrading with cathodic protection. See 40 CFR § 280.21(b)(2)(iv).

Specifically, EPA recommends that implementing agencies determine that the combination of:

1) the implementation of procedures in American Society of Testing and Materials (ASTM) Emergency Standard ES 40 - 94, AND;

2) monthly monitoring for releases in accordance with 40 CFR § 280.43(d) through (h) following the upgrade

constitutes a method that prevents releases in a manner that is no less protective of human health and the environment than the methods listed in 40 CFR § 280.21(b)(2)(i) through (iii), for the period of time that the ASTM Emergency Standard is valid. The ASTM Emergency Standard is valid for two years (November 15, 1994 to November 15, 1996).

The Agency recognizes that State and local implementing agencies can be more stringent than the Federal program, and that they may choose to accept or not accept this recommendation. Owners and operators of USTs should check with their implementing agency to determine if the above combination method is accepted before using it for regulatory compliance.

Included in "2) monthly monitoring..." above are interstitial monitoring, automatic tank gauging, ground water and vapor monitoring, and, where accepted by state and local implementing agencies, statistical inventory reconciliation or other methods meeting the standards in the referenced regulations. The combination of tank tightness testing and inventory control is not included in the referenced regulations.

The ASTM Emergency Standard sets forth for the first time procedures for inspecting and assessing the integrity of steel tanks without putting a person inside the tank. The Standard also defines the work that must be done so that an interested party can scrutinize the contractor's performance. Moreover, it provides standard procedures and thereby promotes consistency in the upgrading of buried steel tanks in those states and localities that already allow the use of these methods, as well as for those states that are deciding what methods to allow for inspecting and assessing buried steel tanks. For additional background on this issue, please see the attached discussion paper.

Implementing agencies, owners and operators should note that under the ASTM Emergency Standard there are criteria that providers of the services included in ES 40 - 94 must meet. For example, determining tank condition and suitability for upgrade using non-invasive techniques must be based on a data base from at least 100 sites where at least 200 tanks were excavated and evaluated. Also, there are many steps requiring action by a "corrosion expert," a term that has the same definition as in EPA's UST regulations.

It should be noted that EPA's UST regulations also provide for interior tank lining to be used as an upgrade option for existing UST systems. This guidance is in no way intended to discourage the use of tank lining as an acceptable upgrade option.

If you have any questions about ASTM ES 40 - 94, please call our technical contacts on this issue, Randy Nelson EPA Region 7 at (913) 551-7220, or Paul Miller at (703) 308-7242.

Attachment

cc: Dave Webster, Region 1
Stanley Siegel, Region 2
Robert Greaves, Region 3

Mary Kay Lynch, Region 4
Norman Niedergang, Region 5
Guanita Reiter, Region 6
Lynn Harrington, Region 7
Robert L. Duprey, Region 8
Laura Yoshii, Region 9
Ken Feigner, Region 10
OUST Management Team, via LAN
Stephen Crimaudo, ASTSWMO
Michael Baach, Corrpro Companies, Inc.
James Bushman, Bushman and Associates, Inc.
Vince Hock, U.S. Army Construction Engineering Research Labs
George Kitchen, ILFC
David Krause, Chair, Public Affairs Comm., NACE Int'l
Tony Rieck, National Leak Prevention Association
Dr. Warren Rogers, Warren Rogers Associates
Joe Lehmann, SUBCON, Inc.
James Lary, HARCO Technologies Corporation
Mike Paisley, Time Oil Co.
Anthony Tafuri, RREL Edison
Shonee Clark, OUST (Compendium)
Randy Nelson, Region 7
David Wiley, OUST, via LAN
Paul Miller, OUST, via LAN
Patrick Barr, ASTM Headquarters
John Piazza, Southern Cathodic Protection
Jean Johnson, API
John Huber, PMAA
Marc Katz, NACS
Frank Ryan, SSDA
Tom Osborne, SIGMA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 14 1995

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Supplementary Guidance on the Use of ASTM Emergency Standard ES 40-94

FROM: Lisa C. Lund, Acting Director
Office of Underground Storage Tanks

TO: State UST Contacts
UST/LUST Regional Program Managers

This memorandum provides further guidance on the use of American Society of Testing and Materials (ASTM) Emergency Standard ES 40-94 and builds on our guidance of May 18, 1995 (attached). Two issues are addressed. The first issue is manual tank gauging. The second is concern about differences between the May 18th memo and previously circulated drafts. Our purpose here is to clarify our position on these topics and to provide implementing agency officials with additional information on this rather complex issue.

Regarding the first issue, a question has been raised on how manual tank gauging fits into our May 18, 1995 guidance. Manual tank gauging, performed according to 40 CFR 280.43(b), does qualify as a monthly leak detection method for tanks with capacities up to and including 550 gallons. (With additional restrictions, it also can be used on tanks up to and including 1000 gallons, under 280.43(h)[1].) Therefore, although its use may be rare, manual tank gauging is included in the list of acceptable leak detection methods in our guidance.

Regarding the second issue, in drafts of November 15, 1994 and February 3, 1995, we stated that OUST "believes that, when used in combination: 1) the implementation of procedures in ASTM Emergency Standard ES 40-94, and; 2) [certain leak detection procedures] constitute a method that is no less protective of human health and the environment than the methods listed in 280.21(b)(2)(i) through (iii)...." Furthermore, the drafts stated that we recommend that UST program implementing agencies make such a "no less protective" determination.

---

[1] See booklet *Manual Tank Gauging: For Small Underground Storage Tanks*, EPA 510-B-93-005.

In the final guidance of May 18, we made the same recommendation, reworded slightly to match the regulatory language. However, the final did not contain a statement that EPA or OUST believes that the combination was as protective.

First, we acknowledge that there has been some confusion on this issue, and apologize for any inconvenience that the changes may have caused. We made multiple changes as we attempted to incorporate comments which made our guidance both clearer and legally correct. We certainly did not anticipate that this particular change would alter the way the guidance was viewed.

Second, please be assured that we would not recommend that implementing agencies make a determination under the federal UST regulations if we did not ourselves believe that it was a worthwhile option, based on the best available technical information.

EPA does believe that in general the combination of ES 40-94 and monthly leak detection per either 280.43(b) or 280.43(d) through (h) prevents releases in a manner that is no less protective of human health and the environment than the methods listed in 40 CFR 280.21(b)(2)(i) through (iii). Therefore, EPA recommends that implementing agencies accept this combination as no less protective. We acknowledge that there are variables among jurisdictions, including soil characteristics and availability of technical expertise. The Agency recognizes that implementing agencies may choose to be more stringent than EPA. Thus, state and local implementing agencies may make the final decision on this issue. In situations when EPA is the implementing agency, e.g., on tribal lands, EPA Regions are hereby guided to accept this combination as preventing releases in a manner that is no less protective.

As you know, for the vast majority of regulated USTs, EPA is not the primary implementing agency, but rather a resource for other implementing agencies. There are several sections in the UST regulations when the implementing agency may make a determination that an alternative method or time frame is no less protective. One is 280.21(b)(2)(iv), which allows an implementing agency to determine that an alternative method of ensuring integrity is no less protective.

Why doesn't EPA make a "no less protective" determination itself? During review of comments on the guidance drafts, it became clear that for programmatic and legal reasons, and because of the need to issue guidance in a timely manner, the best option was not for EPA itself to make a determination under 280.21(b)(2)(iv) for any class of USTs, whether it is or is not the implementing agency. We estimate that it would take the Agency over a year to issue such a formal determination, by which time the Emergency Standard would be near expiration. The preamble to the final rule's discussion about leak detection methods is relevant to this subject, and supports the option we chose.

> "The Agency is convinced ... that allowing approval by the implementing agency, including those at the state and local level, will enable a new method to be used more quickly because the implementing agencies would not have to wait for a Federal approval before a method could be implemented. In addition, the precedent set when a new method passes

an evaluation in one implementing agency should facilitate succeeding reviews by other agencies." (53 Fed. Reg. 37165)

I hope that this information helps you make decisions that are right for your program regarding this issue. If you have any questions about this matter, please call Randy Nelson of EPA Region 7 at (913) 551-7220, or David Wiley of OUST at (703) 308-8877.

Attachment (without Discussion Paper)

CC: Larry Brill, Region 1
Stanley Siegel, Region 2
Robert Greaves, Region 3
Mary Kay Lynch, Region 4
Norman Niedergang, Region 5
Willie Kelley, Region 6
Bill Pedicino, Region 7
Robert L. Duprey, Region 8
Laura Yoshii, Region 9
Ken Feigner, Region 10
UST/LUST ORC Attorneys
OUST Management Team, via LAN
Shonee Clark, OUST (Compendium)
Robert Hillger, OSPRE
Paul Miller, OUST, via LAN
Kathy Nam, OGC
Randy Nelson, Region 7
Joan Olmstead, OECA
Anthony Tafuri, NRMRL Edison
Lee Tyner, OGC
David Wiley, OUST, via LAN
Patrick Barr, ASTM
James Bushman, ASTM Integrity Assessment Task Group chair
Stephen Crimaudo, ASTSWMO
Shelley Leavitt Nadel, NACE International
Tony Rieck, National Leak Prevention Association

DCSWERA1\G:\Share\OUST\TechIsue\IntgCl10.W51

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

OCT 21 1996

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Interim Guidance on Integrity Assessment of Bare Steel USTs

FROM: Joshua Baylson, Acting Director
Office of Underground Storage Tanks

TO: State UST Program Managers
EPA UST/LUST Regional Program Managers

The purpose of this memorandum is to provide guidance regarding integrity assessment requirements for bare steel underground storage tanks (USTs) ten years old or older under 40 CFR 280.21(b)(2)(iv). This subject is of great interest and importance as we near two dates -- December 22, 1998, by when all regulated UST systems must be protected from corrosion, and November 15 of this year, when a key industry standard, ASTM ES 40 - 94, expires. A proposed replacement to ES 40-94 is currently undergoing revision through the ASTM process; however, based on meetings the week of October 14, ES 40-94 will expire before a replacement can be finalized.

OUST recommends that implementing agencies continue to follow their current policies regarding allowed integrity assessment methods until more information is available and OUST issues further guidance.

In the past, through guidance dated May 18, 1995, and September 14, 1995, OUST recommended that states find that the combination of the techniques listed in ASTM Emergency Standard ES 40-94 and monthly leak detection monitoring are no less protective of human health and the environment than those techniques listed at 40 CFR 280.21, for the two-year life of the emergency standard. We are not able to provide further guidance now because the ultimate fate of ES 40's proposed replacement is unknown, and because we would like to include some additional information. This information will include, for both internal (human entry) inspection and the alternative technologies, limited field observations from an EPA engineering study and summaries of performance data from vendors. It also will include the results of a search of recent literature and interviews with experts regarding the likelihood of USTs testing tight but still leaking after the application of cathodic protection.

In our May 1995, guidance we noted that monthly leak detection monitoring following upgrading according to ES 40-94 would provide helpful performance data. We are very interested in any such data you may have regarding the leak-free performance of tanks upgraded after assessment by either internal inspection or alternative methods.

We acknowledge that integrity assessment of older tanks is a controversial issue and understand that many of you are under pressure to craft your policies in certain ways. OUST recently has become aware that a small number of states have allowed another approach to meet the "as protective" standard for these older tanks. This approach is similar to one of the options listed in the regulations at 40 CFR 280.21 for upgrading USTs which are less than ten years old. The approach involves performing a tank tightness test prior to adding an impressed current cathodic protection system. Another tightness test is then required three to six months following the addition of cathodic protection to ensure the tank has not begun leaking since the corrosion protection upgrade. An additional requirement is that monthly leak detection monitoring be employed on the upgraded system. While this may at first seem to be a simple, low cost technique to evaluate the suitability of an older tank for upgrading, OUST has technical concerns with this approach. **At this time we recommend against changing to a policy relying only on leak detection for assessing older bare steel tanks for integrity.**

The first concern relates to why the ten year old breakpoint was incorporated into the regulations in the first place. The preamble to the regulations (see 53 Fed. Reg. 37132) states:

> For tanks 10 of age and older, these two methods above (either a pair of tank tightness tests or monthly release detection monitoring) are inadequate to ensure structural soundness before the cathodic protection system is installed. ... As described above, unprotected tanks often corrode through but do not leak because the corrosion product, backfill, and interior sludge seal the hole.... EPA has concluded ... that as many as 7 percent of existing USTs are corroded through, but not leaking. Many more existing tanks may be heavily corroded and not suitable for cathodic protection alone as an upgrading measure.

In writing the regulations, EPA believed that newer tanks were much less likely to have corrosion holes than older tanks. Therefore, EPA allows this option only for tanks under ten years of age. At this time, we do not have any studies or technical documentation which contradict the preamble or regulations in this regard.

Second, we have heard of tanks having holes with tightly adhering rust (so-called “rust plugs”) beginning to leak after the addition of cathodic protection. Once impressed current is added to a tank with rust-plugged holes, the current which protects the tank also can loosen the rust plugs, causing the once-plugged hole to begin leaking.

Third, a tank which has a very small leak or which has a hole that is not yet leaking because it is blocked by something (such as clay, sludge, or other material) external to the tank, will pass a tightness test but begin to leak or leak at a higher rate over time. A tank such as this should either be closed or repaired prior to being upgraded.

At this time we recommend that implementing agencies exercise caution in any contemplated reformulation of policies, and that they continue to follow their previous policies until we issue further guidance regarding integrity assessments. It is imperative that we assure that only those tanks suitable for upgrading are upgraded, so as to prevent another generation of leaking tanks. We continue to believe that ensuring the integrity of USTs ten years old or older prior to upgrade is vital. Again, we note that no studies or other technical information have been provided to contradict the language in the preamble or the technical regulations. If you have any information to share or questions to ask, please contact David Wiley at (703)603-7178.

cc: Regional Program Managers’ Supervisors
OUST Program Directions Team
OUST Desk Officers
David Wiley, OUST
Anthony Tafuri, Edison
Carolyn Esposito, Edison
Stephen Crimaudo, ASTSWMO
Jim Bushman, Chair, ASTM E50.01 “CP” Task Group
Tony Rieck, National Leak Prevention Association
Dennis Rounds, Chair, ASTM Subcommittee E50.01
Patrick Barr, ASTM

G:\Share\OUST\TechIsue\IntegGui.de5

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

JUL 25 1997

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Guidance On Alternative Integrity Assessment Methods For Steel USTs Prior To Upgrading With Cathodic Protection

FROM: Anna Hopkins Virbick, Director
Office of Underground Storage Tanks

TO: EPA UST/LUST Regional Program Managers
State UST Program Managers

This memorandum provides guidance that pertains only to a relatively small subset of all underground storage tanks (USTs). This subset of USTs consists of steel USTs that are not yet protected from corrosion, that will not be internally lined to meet the 1998 deadline for corrosion protection, and that will be assessed by alternative methods other than either human-entry internal inspection or leak detection before cathodic protection is added.

In our memorandum of October 21, 1996, we recommended to UST program implementing agencies that they continue to follow their current policies regarding allowed integrity assessment methods for this subset of tanks until more information and guidance became available. On March 6, 1997, we circulated additional information and draft guidance. Today's memorandum finalizes our guidance on this subject. The guidance promotes protective and affordable integrity assessments while maintaining regulatory flexibility for implementing agencies.

Guidance On The Use Of Alternative Integrity Assessment Methods

Federal UST regulations require that existing steel tanks without corrosion protection must be assessed for structural integrity before cathodic protection can be added to meet corrosion protection requirements. Basically, tanks that are not structurally sound must not have their operational lives extended. Specifically, the federal UST regulations at 40 CFR § 280.21(b)(2) state that an assessment method may be used to ensure the integrity of steel tanks prior to upgrading with cathodic protection if the assessment method is listed in the regulations or if the implementing agency determines that an alternative assessment method prevents releases in a manner that is no less protective of human health and the environment than those listed. Today's guidance pertains to determinations of alternative integrity assessment methods that are not listed in the federal regulations.

EPA recommends that implementing agencies determine that an alternative integrity assessment method that meets either Option A or Option B below be considered to prevent releases in a manner that is no less protective of human health and the environment than the methods listed in 40 CFR § 280.21(b)(2)(i) through (iii), which include human-entry internal inspection and, for tanks less than 10 years old, certain leak detection methods.

Option A. **Ensure tank integrity by using an alternative integrity assessment method that is in accordance with a standard code of practice developed by a nationally recognized association or independent testing laboratory.**

Option B. **Ensure tank integrity by using a vendor-supplied procedure that has been successfully evaluated and certified by a qualified independent third party to meet specified performance criteria regarding detection of perforations and detection of either internal or external damage. Within Option B, the criteria for proving tank integrity are as follows:**

1. Detect *all* perforations; *and*

2. *One of the following:*

a) Detect external pits deeper than 0.5 times the required minimum wall thickness, *OR*

b) Detect internal pits deeper than 0.5 times the required minimum wall thickness *AND* any internal cracks or separations.

To meet a criterion, a method must demonstrate a probability of detection of at least 95 percent and a probability of false alarm of no more than 5 percent.

After March 22, 1998, EPA recommends that implementing agencies approve the use only of alternative integrity assessment methods meeting either Option A or Option B. Before March 22, 1998, agencies should maintain their current policies for alternative integrity assessment methods that do *not* meet either Option A or Option B. Also, before March 22, 1998, agencies should allow upgraded tanks that have used alternative integrity assessment methods meeting either Option A or Option B to select a leak detection method from those available after March 22, 1998 (as discussed below in today's guidance).

This guidance is not intended to discourage the use of human-entry internal inspection as an assessment method or tank lining as an acceptable upgrade option. EPA's UST regulations allow for interior tank lining to be used as an upgrade option for tanks lacking corrosion protection (40 CFR § 280.21(b)(1)). This guidance addresses only § 280.21(b)(2)(iv), which regards methods not specifically listed in the federal regulations.

The Difference Between "Method" And "Vendor-Supplied Procedure"

Option A addresses "integrity assessment methods" and Option B addresses "vendor-supplied procedures." Both "methods" and "procedures" share the common essential task of verifying the integrity of the tank, but they differ in the guidance as follows. A "method" is a general technology (such as the use of robotic devices or diagnostic modeling) that is in accordance with a standard code of practice. A "vendor-supplied procedure" is an application of a technology, usually marketed as a patented brand name and procedure. Under Option B, a "vendor-supplied procedure" must be successfully evaluated and certified by a third party. However, the guidance does not recommend the certifying of each individual contractor who may be the local provider of a "vendor-supplied procedure."

Option A: Standard Codes Of Practice

Option A recommends that each alternative integrity assessment method comply with a standard code of practice developed by a nationally recognized association or independent testing laboratory. Compliance with a standard code is a requirement in almost all other areas of the federal UST technical regulations. Codes of practice are often updated over time, and so the code used must be the code applicable at the time that the alternative assessment is conducted.

The American Society for Testing and Materials (ASTM) has been the most active code body for alternative integrity assessments. A standard is being drafted by a joint task group under Subcommittees E50.01 on Storage Tanks and G01.10 on Corrosion in Soils. The first draft of the "Standard Guide for Three Methods of Assessing Buried Steel Tanks" was recently balloted, and is very similar to the expired ASTM ES 40, "Emergency Standard Practice for Alternative Procedures for the Assessment of Buried Steel Tanks Prior to the Addition of Cathodic Protection." Since balloting is within G01.10 only, interested parties should contact ASTM's Robert Held at (619) 832-9719 for information about participating in this standard development activity.

Although ASTM committees have been the most active, other nationally recognized associations and independent testing laboratories are not precluded from developing standard codes of practice.

Option B: Evaluation And Certification Process

Option B recommends that each vendor-supplied procedure intended to ensure tank integrity must receive third-party evaluation and certification that it meets criteria for establishing the integrity of a tank. Implementing agencies should allow the use only of those vendor-supplied procedures successfully evaluated and certified by a qualified independent third party to meet specified performance criteria regarding detection of perforations and detection of either internal or external damage.

In an evaluation and certification process, a vendor first contracts with a third party for evaluation. This third party should be a qualified test laboratory, university, or not-for-profit research organization with no financial or organizational conflict of interest. Based on the nature of the performance criteria, evaluations will likely be *qualitative*, but quantitative evaluations also are acceptable. The evaluation is performed first *without* and then *with* information about the leak status of the tank divulged to the vendor. The method's performance characteristics, both with leak data and without, are determined, summarized on a "short form," and certified by the evaluator. Owners and regulators can then use this documentation, along with other information, to make decisions that are right for their particular situations.

We have determined that an independent evaluation and certification process is already available for use in the UST community. This finding is based on discussions with vendors and third-party evaluators and industry's experience with other UST system technologies.

In an evaluation, the determination of whether or not a vendor-supplied procedure meets the criteria *may* be based in part on leak detection data. This is allowed because protectiveness is based on the performance of the complete vendor-supplied procedure, and leak detection results often play a large role in integrity assessments. However, the performance of a vendor-supplied procedure *without* inclusion of leak detection data should still be reported on the short forms for informational purposes.

As is clear from the recommendations, no integrity assessment methods or vendor-supplied procedures that have been in use before March 22, 1998 should be "grandfathered" or considered exempt from following a standard code or from evaluation after March 22, 1998. However, those vendor-supplied procedures that were part of the 1996 field study conducted by EPA's Edison lab can use applicable data generated in that study as part of a more comprehensive evaluation. In addition, even if a company follows a standard code of practice, it may voluntarily put its vendor-supplied procedure through this evaluation process in order to obtain independent third-party documentation of performance characteristics.

Evaluation Protocols For Option B

More detailed information on evaluation can be found in the "Quality Assurance Project Plan" (QAPP) prepared for EPA's engineering study conducted in 1995 and 1996. We consider the original QAPP written for the EPA field study to be a viable, peer-reviewed evaluation test protocol. We recommend that evaluations conducted in accordance with it be considered valid. However, removal and examination as detailed in the QAPP may not be necessary, at least not for all tanks used in an evaluation. An approach that uses data in lieu of physical testing can be used if all relevant data requirements are factored in. An evaluator may choose alternative evaluation protocols or procedures, because of the potentially high cost of following the QAPP to the letter or because of special characteristics of the vendor-supplied procedure under evaluation. (The QAPP calls for an assessment method to be used on approximately 100 tanks, which are then removed from the ground for testing and inspection.) The development of other protocols is not precluded, but rather is encouraged.

We have investigated the EPA/private sector Environmental Technology Verification program, and found that it probably cannot provide assistance in the needed time frame. EPA will not be involved in the writing of additional protocols or in the funding of evaluations. However, EPA staff will be available to comment on draft protocols and to provide guidance to implementing agencies. In addition, we will provide optional summary forms, or "short forms," for the QAPP, as suggested by commenters. These will help industry give implementing agencies and owners relevant information in a consistent and understandable format.

Evaluation Criteria In Option B

The criteria in Option B above are based on those found in the QAPP. On each criterion, methods must demonstrate a probability of detection of at least 95% and a probability of false alarm of no more than 5%. Note that 100% accuracy is not specified. We have found it protective and cost-effective to rely on a series of multiple, complementary, and high-quality measures to achieve the greatest protection at a reasonable cost.

In addition to a mandatory criterion on perforations, a method must pass evaluation of a criterion for either external or internal damage. We structured the criteria in this way based partly on consistency with internal (human-entry) inspection standard codes. In addition, these criteria are based on our belief that not allowing the upgrading of tanks with either significant interior or exterior damage (unless they are repaired) yields significant benefits over the costs incurred. We do not believe, however, that the additional cost of assessing a tank for both internal and external damage provides a net benefit in significantly greater protection.

A criterion for loss of wall thickness over a wide area of the tank is not included, because our research found that failures due to uniform corrosion are very rare. Likewise, a criterion for tank deformation is not included, because it is generally found to be an issue only in fiberglass tank installations.

Recommended Commencement Date

Setting the recommended commencement date of March 22, 1998 allows time for standards to be developed and evaluations to be conducted, and comes before a significant portion of the anticipated assessment work. We extended the date proposed in our draft guidance in response to comments requesting more time. ***Note: the December 22, 1998 deadline for all existing UST systems to meet spill, overfill, and corrosion protection requirements will not be extended.***

Monthly Leak Detection Not Required

We earlier proposed to include stand-alone monthly leak detection monitoring in combination with the integrity assessment options. However, this monitoring is no longer part of our recommendation for integrity assessment methods fulfilling Option A or vendor-supplied procedures fulfilling Option B. We deleted monthly monitoring based on technical merit, consistency, and simplicity. We believe that if an integrity assessment method complies with either a standard code of practice or evaluation procedures as described above, then leak detection monitoring beyond that required in the federal regulations is not warranted on a nationwide basis, and we have not found performance data that indicates otherwise. In addition, deleting the additional monitoring brings all assessment methods in line with each other and simplifies the compliance picture.

If the implementing agency follows today's guidance, compliant USTs (correctly upgraded through alternative assessment, cathodic protection, protected piping, and spill/overfill protection) could follow the requirements of § 280.41(a)(1) allowing either stand-alone monthly monitoring or, for up to ten years, the combination of inventory control and tightness testing every five years. Note that the period during which this combination leak detection method is valid may be less than 10 years if the tank itself meets the 1998 standards for corrosion protection before other UST system components meet 1998 standards for spill, overfill, and corrosion protection, as clarified in our memorandum of July 25, 1997, "Applicability Of A Combination Leak Detection Method For Upgraded Underground Storage Tanks."

Recommendation Against Leak Detection As An Integrity Assessment

The question of whether leak detection alone should be used to assess older tanks prior to upgrading with cathodic protection has been raised from time to time. We received numerous comments on this subject, nearly all in agreement that leak detection alone is not sufficient.

Although we recognize the important role leak detection generally plays and allow the use of leak detection results in evaluations of integrity assessment methods, EPA does not recommend that leak detection alone be considered sufficient to assess the integrity of USTs 10 years old or older.

State Program Approval

A decision either to adopt or not adopt EPA's recommendations regarding integrity assessment would not affect the status of state program approval or of an application for approval. This is because EPA is providing recommendations only and not amending its regulatory criteria for state program approval.

Federal And State Consistency

We hope this guidance is accepted by implementing agencies because there are benefits to having consistency across jurisdictions. However, EPA recognizes that State and local requirements may differ from Federal requirements. We have included in Attachment 1 additional items that implementing agencies may consider in developing their integrity assessment policies.

Guidance Intended To Ensure Quality Of Integrity Assessments

EPA believes today's guidance will benefit the UST community and protect human health and the environment by ensuring quality alternative integrity assessments that can lead to extended operational life of older steel tanks. Option A can ensure that alternative integrity assessment methods are valid by being in accordance with national codes of practice. Option B can ensure that vendor-supplied procedures have met rigorous third-party evaluation and certification. However, for these Options to be most successful, UST owners will need to be informed to use only methods that meet code or vendor-supplied procedures that have been certified. Implementing agencies should make concerted attempts to inform their UST owners about what they need to look for to make sure they get a reliable integrity assessment.

Acknowledgments

Our March 6 draft guidance package sought input on the general approach, specific evaluation criteria, costs of evaluations, compliance and enforcement implications, and timing. I thank the state and EPA representatives who provided comments to our draft, including those from Arizona, District of Columbia, Michigan, Tennessee, and EPA's Office of General Counsel. I also thank the many other individuals and organizations that provided comments.

Disclaimer

EPA's Office of General Counsel advises that the policies set out in this document are not final agency action, but are intended solely as guidance. They are not intended, nor can they be relied upon, to create any right, benefit or trust responsibility, enforceable by any party, in litigation with the United States.

cc: EPA UST/LUST Regional Program Managers' Supervisors
OUST Program Directions Team

OUST Desk Officers
Betty Arnold, OUST Compendium
Carolyn Esposito, EPA NRMRL, Edison, NJ
Daniel Sullivan, NRMRL, Edison, NJ
Kathy Nam, EPA OGC
Joan Olmstead, EPA OECA
Larry Magni, American Petroleum Institute
Dennis Rounds, Chair, ASTM Subcommittee E50.01
Susan Canning, ASTM Staff Liaison, Committee E50
Richard Huriaux, DOT Office of Pipeline Safety
Shelley Leavitt Nadel, NACE International
Marc Katz, National Association of Convenience Stores
Chappell Pierce, OSHA Directorate of Safety Standards Programs
Bob Renkes, Petroleum Equipment Institute
John Huber, Petroleum Marketers Association of America
Mark Morgan, Petroleum Transportation & Storage Association
Roy Littlefield, Service Station Dealers of America
Tom Osborne, Society of Independent Gasoline Marketers of America
John Worlund, Converse Environmental Consultants Southwest
James Bushman, Bushman and Associates
Michael Baach, Corrpro Companies
George Kitchen, International Lubrication and Fuel Consultants
Derick Sharp, National Leak Prevention Association
John Piazza, Southern Cathodic Protection
Bud Mattox, Tanknology-NDE
Warren Rogers, WRA Environmental

ATTACHMENT 1

ADDITIONAL ITEMS FOR CONSIDERATION IN DEVELOPING INTEGRITY ASSESSMENT POLICIES

Agencies that implement underground storage tank programs may find the following items useful in conjunction with EPA's guidance in constructing their integrity assessment policies:

* Requiring certain documentation be submitted by vendors to UST owners or implementing agencies (or both). An example for human-entry assessments following NLPA 631 is Form CF-2, "Internal Inspection Affidavit," which must be maintained by the owner, according to the standard. An example for an alternative assessment would be a certification by the vendor that the work meets code or a short form summarizing the evaluation and limitations of a particular method.
* Requiring that companies, individuals, or both be licensed in order to perform assessments.
* Requiring monthly stand-alone leak detection monitoring following assessment and upgrade.
* Limiting the time between assessment and upgrade (for example, limit the time to six months).
* Putting mechanisms in place to make the vendor responsible for a tank failure due to improper assessment.
* Reviewing each vendor-supplied procedure before allowing it to be used, even if a vendor claims the procedure complies with a standard code of practice, to ensure the procedure meets all requirements of the code and of the agency.

G:\Share\OUST\Policy\I_A_Gui11.wpd

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

OCT 9, 1998

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Alternative Integrity Assessment: New ASTM Standard

FROM: Anna Hopkins Virbick, Director /s/
Office of Underground Storage Tanks

TO: UST/LUST Regional Program Managers
State UST Program Managers

The purposes of this memorandum are to bring your attention to a new standard from ASTM (the American Society for Testing and Materials) for underground storage tank (UST) integrity assessment and to clarify how this standard relates to our previous guidance. While our guidance has not changed, this recent development can change the way integrity assessments (which are performed before upgrading bare steel tanks with cathodic protection) are done in jurisdictions that follow our guidance.

Background

EPA's July 25, 1997 guidance on this subject (attached) remains in effect essentially as written. As before, we recommend that implementing agencies determine that an alternative (to human entry) integrity assessment method be considered to meet the December 22, 1998 upgrading requirements *only if* it meets one of two options. Option A is accordance with a standard code of practice developed by a nationally recognized association or independent testing lab. Option B is using a procedure that has been successfully evaluated and certified by a qualified independent third party to meet the performance criteria specified in the guidance.

Regarding this issue, implementing agencies have been free to make their own determinations, including those different from EPA's guidance, and this will continue to be the case. First we discuss developments regarding Option A.

ASTM Action and Its Impacts

On September 10, 1998, ASTM approved an UST integrity assessment standard, ASTM G 158-98, "Standard Guide for Three Methods of Assessing Buried Steel Tanks." *EPA believes that assessments done in accordance with ASTM G 158 satisfy Option A in our guidance, and can be relied on for compliance with the upgrade requirements*, with the following condition on the visual inspection method. The condition is that the visual inspection method must be capable of detecting all pits and holes of size 1/8 inch (0.32 cm) or greater. (This stipulation was inadvertently left out of the standard during revision.)

We will provide you with a copy of the new standard as soon as possible. To purchase copies, please contact ASTM at (610)832-9585 or www.astm.org. In the meantime, note that the new standard is substantially the same as the November 25, 1997 draft which we circulated to you on January 13 of this year. Other items in the standard that you should note include the following.

* Although the standard requires that a form be filled out with certain information and notarized, this form does not necessarily provide a representative, comprehensive evaluation of a procedure's performance, or meet EPA's Option B.
* The standard not only requires that a leak detection system be used within six months of the integrity assessment, it requires that this be a tightness test at the 0.1 gallon per hour leak rate (see section 1.4).
* A leak detection test by itself is not sufficient to determine that a tank is suitable for upgrade.
* Finally, the use of a model to determine tank suitability must be based on present, not future, calculated probabilities of corrosion failure.

Regarding implementation, ASTM G 158 is similar to the former ASTM ES 40 in that it provides a blueprint for assessments, but does not address field implementation in detail. In the past few years, problems have been encountered at some sites where vendors claimed to follow the former ES 40, and problems will not all be solved by G 158. These problems included deviation from the standard, use of the standard where not appropriate, and poor documentation. Field implementation issues are often better addressed by implementing agencies and owners, rather than at the national level. However, in response to input from regulators, we have prepared a checklist to help regulators, owners, and operators ensure that G 158 requirements are followed. Please find attached the checklist, which lists all the requirements of the new G 158 and of the former ES 40.

For your information, ASTM has notified us that it plans to offer training on G 158. The training will target at UST owners, regulators, and environmental professionals. The stated purpose is to help regulators and owners and operators understand: what the new standard will provide; how to evaluate the credentials of vendors; how to assure the quality of work; and what results should be expected for each of the methods. ASTM will send detailed information on the training to you. In recognition of the importance of this training information to state agencies, a New England Interstate Water Pollution Control Commission grant is available to reimburse certain travel costs for state employees with a demonstrated hardship. The grant can pay for only a limited number of travellers, for no more than one person per state, and for no training or registration fees.

Third-Party Evaluation

Third-party evaluation of integrity assessment procedures (Option B in our guidance) continues to be a viable means for meeting EPA's guidance. For more information on procedures available under Option B, please see the List of Integrity Assessment Evaluations, which is a product of a state/EPA work group, and available from our office. Remember to note the limitations of each evaluation.

A protocol document is available to help assessment vendors and evaluators who wish to go through third-party evaluation. It is titled "Test Protocol For Evaluating Integrity Assessment Procedures For Underground Storage Tanks" (EPA-510-B-98-004). EPA regional offices, state agencies, and interested trade and professional associations are receiving a copy. This document includes the Quality Assurance Project Plan written in 1995. While the information included in the document has been available from EPA for some time, this booklet combines test procedures, forms, and past guidance in a single technical resource that can be ordered through EPA's usual channels. To obtain a copy, call EPA's document center at 800 490-9198 or EPA's hotline at 800 424-9346.

Relationship of Option A to Option B

EPA's recommends that either Option A or B be met. Of course, both can be met as well. Some implementing agencies may allow one option, but not the other. In such cases it is important to note that procedures meeting Option A do not necessarily meet Option B, and vice versa.

Human-Entry Inspection

Please remember that traditional, human-entry inspection remains an integrity assessment option that is standardized, viable, and compliant with federal requirements. Today's memorandum is not intended to discourage the use of the human-entry inpection method in any way.

Compliance Options

Some questions and concerns have been raised regarding the compliance status of tanks assessed with alternative integrity procedures and then upgraded with cathodic protection. Please see the attached table, "Compliance Options for Tank Leak Detection and Integrity Assessment." It shows how EPA leak detection and upgrading requirements and guidance apply to various situations. The table is intended as a reference for implementing agencies, which may share its contents with owners and operators if applicable and appropriate. Please note that, in several cases, state requirements supersede the information contained in the table. To give owners and operators a clear understanding of key aspects of compliance, we have created a brief flyer (attached). Below, we further describe certain integrity assessment situations and how our guidance applies to them.

Compliance Concerns: Alternative Assessments Done On or Before March 22, 1998

One group expressed a concern that our guidance might lead regulatory agencies to fine owners of tanks that were assessed with alternative procedures in accordance with ASTM ES 40 before March 23, 1998. This should not be a concern. EPA did not and does not recommend that agencies following our guidance find such alternative integrity assessments — those meeting

ASTM ES 40 and accompanied by monthly leak detection monitoring — invalid for compliance with December 22, 1998 requirements. This is true even if the procedure used never meets Option A or Option B. In support of this position, we believe that owners and operators which chose a procedure in full compliance with the requirements in place at that time should not have to do rework. We also note that procedures and methods may not meet Option A or Option B for a variety of reasons. For example, a former vendor may choose not to submit its procedure for third-party evaluation because it has left the assessment business. Please note that if an alternative assessment procedure does not meet Option A, does not meet Option B, *and* does not meet ASTM ES 40, then it has never been recommended by EPA for use as part of compliance.

Compliance Concerns: Alternative Assessment Done After March 22, 1998

For those assessments performed after March 22, 1998, another concern involves the point in time when an assessment first meets Option A or B. This issue is best understood by looking ahead to the day *after* the December 22, 1998 corrosion protection deadline. On this day the three possible scenarios regarding post-March 22 alternative assessments and our related guidance are as follow.

* An alternative assessment met either Option A or B at the time it was done. Thus, this assessment is valid for compliance.
* An alternative assessment did not meet either Option A or B at the time it was done, but on or before December 22, 1998 the same procedure used *does* meet Option A or B. For example, the assessment procedure used in the past now adheres to a new standard, such as ASTM G 158. This assessment is valid for compliance. (Note that the procedure used cannot have been a scaled down or less stringent version of the one that meets Option A or B.)
* An alternative assessment still meets *neither* Option A nor B. This assessment is *not* valid for compliance, and unless another assessment has been done, the corrosion protection requirements have not been met. This non-compliance continues until the old assessment procedure is shown to meet Option A or B, or until a compliant substitute assessment is performed.

Thus, for an assessment done after March 22, 1998, unless a procedure meets Option A or B at the time it is performed, the vendor cannot accurately represent that the UST will certainly meet the December 22, 1998 requirements. It may turn out to be the case; but it may not.

Compliance Concerns: Potential Uncertainty

One commenter voiced a concern that there has been uncertainty in the market. It is true that integrity assessment has been an active and contentious subject area for years. However, *this does not suppport or excuse failure to comply with the December 1998 deadline*. At all times during the ten years since federal regulations were published, an owner could perform either a traditional human-entry inspection method or an alternative method, in full compliance with EPA regulations and guidance.

Conclusion

We believe that the national UST program has, in part via implementation of our July 1997 guidance, built a framework that provides for a safe and environmentally protective outcome, but allows flexibility in choosing the means to achieve that outcome. Some claimed that no companies would be able to or would choose to meet our guidance, leaving owners with less flexibility and higher costs. History has shown this claim to be false. Better performance has been achieved without higher costs. The UST community has seen that industry can provide standard and proven methods. It has seen that, when it comes to the 1998 requirements, *we do not bluff*.

We appreciate the honest feedback and the support that many have provided, including regulators, industry, and members of ASTM Committees G1 and E50. If you have any questions, comments, or suggestions, please contact David Wiley by e-mail at wiley.david@epa.gov, by phone at 703-603-7178, or by fax at 703-603-9163.

Attachments:
* July 25, 1997 EPA "Guidance On Alternative Integrity Assessment Methods For Steel USTs Prior To Upgrading With Cathodic Protection"
* "Checklist of Requirements of Former ASTM ES 40 and Current ASTM G 158"
* "Compliance Options for Tank Leak Detection and Integrity Assessment"
* Flyer -- "Owners Upgrading USTs: Make Sure Your Integrity Assessment Has Integrity"

cc: Joan Olmstead, OECA
Katherine Nam, OGC
OUST Desk Officers
RCRA/Superfund/EPCRA Hotline
Victor Chakur, ASTM G01.10 Chair
Dr. George Schick, ASTM G01.10 UST standard task force
Robert Held, ASTM G01 Staff Mgr.
Dennis Rounds, ASTM E50.01 Chair
Daniel Smith, ASTM E50 Staff Mgr.
Manager of Public Affairs, NACE International
Larry Magni, American Petroleum Institute
Arlene Alexander, National Association of Convenience Stores
Derick Sharp, National Leak Prevention Association
Robert Renkes, Petroleum Equipment Institute
Kristen Manos, Petroleum Marketers Association of America
Mark Morgan, Petroleum Transportation & Storage Association
Roy Littlefield, Service Station Dealers of America
Tom Osborne, Society of Independent Gasoline Marketers of America

cc, cover only:
UST/LUST Regional Program Managers' Supervisors

David Carver, OSWER Standards Coordinator
Mary McKiel, Voluntary Standards Network
Carolyn Esposito, NRMRL, Edison, NJ

C:\compendm\WordPerfect Files of letters\nus16_2.wpd

Checklist of Requirements of Former ASTM ES 40 and Current ASTM G 158

This checklist is intended to be a companion to ASTM G 158-98 (valid 9/10/98), to help regulators and UST owners and operators to ensure that integrity assessments actually meet the standard. It lists the requirements of the standard in highlight fashion. It does not list all the details of the requirements, nor does it include important information that is not a requirement. Thus, this checklist cannot be used as a substitute for the standard. The standard is available from ASTM, at (610)832-9585 or www.astm.org. For those familar with the former ASTM ES 40-94 (which expired 11/15/96) its requirements are provided so that the main differences in the requirements of the two documents can be seen.

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
General Requirements	
☐ Required permits were obtained. (5.1) ☐ Work was performed under the responsible supervision of a corrosion expert. (6.1) ☐ Corrosion expert certified to the tank O/O that the personnel performing the assessment work on the tank were knowledgeable of all the applicable procedures. (6.2) ☐ Corrosion expert certified to the tank O/O that all work was performed in strict accordance with this emergency practice. (6.3) ☐ All applicable federal, state, and local health and safety codes and regulations were complied with. (7.1)	☐ Method A (section 9), B (section 10), or C (section 11) was used to assess the tank's condition. A preliminary site survey was performed per Section 8. The tank was tightness tested per 5.2 and established as not leaking. (1.4) ☐ Necessary authorities were consulted to obtain required permits. (5.1) ☐ The corrosion assessment work was performed under the responsible direction of a corrosion specialist/cathodic protection specialist. (6.1) ☐ The corrosion specialist/cathodic protection specialist certified to tank O/O that the personnel performing the assessment work on the tank were knowledgeable of all the applicable procedures in this guide. (6.2) ☐ Corrosion specialist/cathodic protection specialist certified to tank O/O that all work was performed in strict accordance with this guide. (6.3) ☐ All applicable federal, state, and local health and safety codes and regulations were complied with. (7.1)
Determining the Leak Status of the Tank	
☐ Tanks were assessed using practice E 1430 or a method that had been certified in accordance with Federal EPA requirements to establish that the tanks were not leaking before evaluating the suitability for upgrading. (8.1)	☐ Tanks were assessed by a leak detection system to establish that they were not leaking. (5.2.1) ☐ A tightness test or another release detection system in accordance with NFPA 329 was used. Any release detection must have been capable of detecting a leak from any portion of the tank that routinely contains product and have been independently evaluated and certified in accordance with ASTM E 1526 or the equivalent. Leak detection results were provided to the corrosion specialist/cathodic protection specialist. (5.2.2) ☐ Release detection testing was accomplished within 6 months prior to performing any of the assessment procedures. (5.2.3)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
Preliminary Site Survey	
□ Site specific information was obtained by a corrosion tester who was under the direction of the corrosion expert. (8.2)	□ Site specific information was obtained by a corrosion technician who was under the responsible direction of the corrosion specialist/cathodic protection specialist. (8.1) □ A preliminary site survey was performed pursuant to section 8 and a tightness test was performed pursuant to 5.2 to establish the fact that the tank was not leaking. (8.2)
Non-invasive (statistical modeling only)	
□ Tests were conducted by or under the responsible supervision of a corrosion expert. (9.1.2) □ Stray currents were tested. (9.1.3.1) □ Tank locations, materials of construction, capacity, and dimensions were confirmed and a detailed site sketch produced. (9.1.3.2) □ The presence & extent of corrosion immediately below fill riser was determined using a test probe equipped with a mechanical sensor tip. (9.1.3.2) □ Borehole tests were conducted. (9.1.3.3) □ Corrosion expert considered additional tests (current requirement, coating resistance, and coating efficiency). (9.1.3.4) □ Soil samples were sent to a qualified soil lab and tested in accordance with recognized industry test methods. At minimum, soil resistivity/conductivity, moisture content, soil pH, chloride ion concentration, and sulfide ion concentration data were obtained. (9.1.4) □ Corrosion expert considered performing and evaluating the following tests: hydrocarbon concentration, redox potential, sulfate ion concentration. (9.1.5) □ 1 soil sample of every 10 was subjected to independent QC analysis. All samples were reanalyzed since the last successful QC analysis if QC analysis failed. (9.1.6) □ The basis for analysis was followed. (9.2.1)	□ Tests were conducted by or as directed by a corrosion specialist or cathodic protection specialist. (9.1.1) □ A test for stray currents was done per certain specifications. (9.1.2.1) □ All tanks were located and materials of construction, age, capacity, and dimensions were confirmed. Detailed site sketches were produced. (9.1.2.2) □ The presence & extent of corrosion immediately below fill riser was determined. Any corrosion > 50% of tank wall thickness failed the tank. (9.1.2.2) □ Electrical continuity of tanks and piping was determined. (9.1.2.2) □ Borehole tests were conducted per certain specifications. (9.1.2.3) □ Soil samples were sent to a qualified soil lab and tested in accordance with EPA SW 846, ASTM E 1323, or other recognized industry test methods. At minimum, soil resistivity/ conductivity, moisture content, soil pH, soluble chloride ion concentration, and sulfide ion concentration data were obtained. The report included the results of all test methods used in the evaluation. (9.1.3) □ Corrosion specialist/cathodic protection specialist considered performing tests & evaluating redox potential, sulfate ion concentration, and any other test required by the external corrosion rate analysis model. The report included all test methods used in the evaluation. (9.1.4) □ 1 soil sample of every 10 was subjected to independent QC analysis. All samples were reanalyzed since the last successful QC analysis if QC analysis failed. (9.1.5) □ The statistical analysis model reached a confidence level of 0.99. (9.2.1)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
□ Procedure was based on an evaluation of all data gathered. (9.2.2.1) □ Mathematical formulation conformed to accepted physical and electrochemical characteristics of tank corrosion process. (9.2.2.2) □ Parameter estimates were based on minimum of 100 sites and 200 tanks which were excavated and evaluated by a qualified corrosion expert. A procedure that met standards of statistical /electrochemical admissibility was used. Data were representative of leaking and nonleaking tanks. (9.2.2.3) □ Standard deviation of predicted time to corrosion failure was not > 1.5 years. Model generated a probability of corrosion failure based on a comparison of actual tank age to expected leak-free life. (9.2.2.4) □ Models proposed were specific to soil type & incorporated GW depth & rainfall experienced in the immediate geographical area where testing occurred. (9.2.2.5) □ Report conclusions were based on the expected leak-free life of a tank at a specific site as determined by analysis of the data necessary to determine which tanks were suitable for upgrading with CP. (9.2.3.1) □ Report provided the expected leak-free life and present and future probabilities of corrosion failure for all tanks investigated. (9.2.3.2) □ Report included a listing of tanks whose age was < the expected leak-free life where the probability of corrosion perforation was < 0.05. (9.2.3.3) □ Probability of corrosion failure was < 0.05. (9.2.3.4 and 9.2.3.5) □ For tanks 10 years old and older, the leak detection test that was performed before the tank was assessed was repeated approximately 6 months after cathodic protection was added to ensure its continued leak-free condition. (9.2.3.5)	□ Procedure was based on an evaluation of all data gathered. (9.2.2.1) □ Mathematical formulation conformed to accepted physical and electrochemical characteristics of tank corrosion process. Independent professional validation was completed. (9.2.2.2) □ Parameter estimates were based on minimum of 100 sites and 200 tanks which were excavated and evaluated by a qualified corrosion specialist/cathodic protection specialist. Procedure that meets standards of statistical /electrochemical admissibility was used. Data were representative of leaking and nonleaking tanks. (9.2.2.3) □ Models proposed were specific to soil type & incorporated GW depth & rainfall experienced in the immediate geographical area where testing occurred. (9.2.2.5) □ Standard deviation of predicted time to corrosion failure was not > 1.5 years. Model generated an unconditional probability of corrosion failure. based on a comparison of tank age to expected leak-free life. (9.2.2.5) □ Report conclusions were based on the expected leak-free life of a tank at a specific site as determined by analysis of the data necessary to determine which tanks were suitable for upgrading with CP. (9.2.3.1) □ Report provided the expected leak-free life and present and future probabilities of corrosion failure for all tanks investigated. (9.2.3.2) □ Report included a listing of tanks whose age was < the expected leak-free life and where the probability of corrosion perforation was < 0.05. (9.2.3.3) □ Tank was leak free. (9.3.1) □ Tank age was less than the expected leak free life. (9.3.2) □ Probability of corrosion perforation of the tank was < 0.05 (9.3.3) □ Tank tightness test was conducted 3 to 6 months after CP was added or monthly monitoring with another leak detection system was implemented within 1 month after CP was added. Leak detection system met section 5.2.2. (9.3.4) □ Authenticated vendor-provided information was reported using the form in the Annex. (9.4)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
Invasive Ultrasonic Thickness Testing with External Corrosion Evaluation	
□ Tests were conducted by or under the responsible supervision of a corrosion expert. (10.1.3) □ Stray current corrosion/interference was tested for. (10.1.4) □ Soil resistivity was measured according to Wenner 4 pin method or NACE RP-0285. (10.1.5) □ Structure-to-soil potentials were measured according to RP-0285 with at least 1 potential measurement was made over each tank at the midpoint or end of all metallic components connected to the tank. (10.1.6) □ Soil pH was measured. (10.1.7) □ Electrical continuity/isolation tests were conducted (NACE RP-0187). (10.1.8) □ Additional tests were considered by the corrosion expert. (10.1.9) □ Tanks ten years old or older successfully passed the tests provided for in sections 8 and 10. (10.1.10) □ Corrosion tester performing robotic tests was properly certified. (10.2.1) □ Interior surface of tank was uniform and free of loose scale, paint, dirt, and other deposits that affect examination (according to ASTM E 114). (10.2.3) □ Thickness measurement sensor was calibrated (using ASTM E 797). (10.2.4) □ Couplant used was stored product or compatible with product stored & was appropriate for the surface finish of the examined material. Surface finish/ couplant was acoustically similar to those of the tank & couplant therein. (10.2.5) □ Discrete, located measurements were taken on at least 15 % of the entire tank interior surface (excluding access ways). Additional measurements were made in areas where corrosion was more severe. (10.2.6.1)	□ Tests were conducted by or as directed by the corrosion specialist/cathodic protection specialist. (10.1.2) □ Stray currents were tested for as specified in 9.1.2.1. (10.1.3.1) □ Soil resistivity was measured in accordance with ASTM G 57. (10.1.3.2) □ Structure-to-soil potentials were made using NACE RP-0285, with at least 5 such measurements spaced uniformly about each tank excavation zone. (10.1.3.3) □ Soil pH according to ASTM G 51 and soil chlorides & sulfides according to EPA SW 846 were uniformly gathered from 3 locations about each tank excavation zone. (10.1.3.4) □ Electrical continuity/isolation tests were conducted according to NACE RP-0285 at each UST. (10.1.3.5) □ Corrosion technician that performed robotic tests met certain certification and qualification requirements. (10.2.2) □ Interior surface of tank was uniform and free of loose scale, paint, dirt, and other deposits that affect examination (according to ASTM E 114). (10.2.3) □ Thickness measurement sensor was calibrated (using practice ASTM E 797). (10.2.4) □ Couplant used was stored product or compatible with product stored & was appropriate for the surface finish of the examined material. Surface finish/ couplant was acoustically similar to those of the tank & couplant therein. (10.2.5) □ Wall thickness measurements were made on at least 15% of the tank interior surface (excluding access ways). Thickness measurements were uniformly distributed over the surface of the tank. (10.2.6.1) □ Equipment was capable of accessing at least 95% of the interior surface area. Additional measurements were made (as determined by corrosion specialist/cathodic protection specialist) in areas where corrosion was more severe. (10.2.6.1) □ The maximum allowable position error in each wall thickness measurement position location coordinate was 5% of the maximum tank dimension. (10.2.6.3)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
□ The following data were recorded: operator name and certification level, instrument description (make, model, S/N, and setup couplant), instrument calibration certification (including date performed), cable type and length, scanning mode, search unit description, reference standards, location data for thickness measurement points. (10.2.7) □ Robotic inspection device was capable of entering tank through an existing entry and was versatile enough to traverse 95% of the tank interior (excluding access ways). (10.2.8.1) □ For automated scanning, the search unit was held by a suitable fixed device while the search unit moved mechanically along a predetermined path within the tank in accordance with ASTM E 114. (10.2.8.2) □ The robotic inspection device was able to free the interior surface of rust, loose scale, paint, and other deposits to ensure a clean surface for ultrasonic inspection. (10.2.8.3) □ The robotic inspection system was safe for operation and compatible with the stored product. (10.2.9) □ A prediction model which used thickness measurement test data and soil chemistry data was used to forecast when each tank was expected to leak. The prediction model yielded the years of leak-free life remaining and the probability of a potential leak of the tank in a specific soil condition. The model was based on tank inspection data and included all of the data listed in 10.1.3 through 10.1.8 and any tests performed in 10.1.9. The mathematical formulation was based on accepted physical and electrochemical characteristics of the tank corrosion process. (10.3.2.1) □ There was no pitting greater than 50% of the minimum recommended wall thickness. The average wall thickness of each square meter was > 85% of the original wall thickness. The results of the prediction model, as determined by the corrosion expert, supported that CP was both reasonable and viable. (10.3.2.2) □ The inspection report summarized all tank data collected from the inspection and provided results from the prediction model for each tank, including recommendations w.r.t. the tank's suitability for upgrading with CP. The corrosion expert was responsible for all data analysis and recommendations. (10.3.3)	□ The following data were recorded: operator name and certification level, instrument description (make, model, S/N, and setup couplant), instrument calibration certification (including date performed), cable type and length, scanning mode, search unit description, reference standards, location data for thickness measurement points. (10.2.7) □ The user of this standard established appropriate safety and health practices and determined the applicability or regulatory limitations prior to use. (10.2.8) □ A prediction model was used to determine the probability of an individual tank leak due to corrosion. The model yielded the years of leak-free life remaining and the probability of a potential leak of the tank in a specific soil condition. It was based on tank inspection data collected and included all of the site specific parameters in sections 10.1.3.1 through 10.1.3.5 along with any tests performed in 10.1.4. The mathematical formulation was based on accepted physical/electrochemical characteristics of tank corrosion process. (10.3.2.1) □ There was no measured pitting which perforated the tank wall. 98% of all thickness measurements were > or equal to 50% of the minimum recommended wall thickness as provided in UL 58 or the documented original wall thickness. The average metal wall thickness of each square meter was >85% of the original wall thickness. The prediction model results, as determined by the corrosion specialist/cathodic protection specialist, supported that CP was both reasonable and viable. (10.3.2.2) □ The inspection report summarized all tank data collected from the inspection and provided results from the prediction model for each tank, including recommendations w.r.t. the tank's suitability for upgrading with CP. The corrosion specialist/cathodic protection specialist was responsible for all data analysis and recommendations. (10.3.3) □ The tank passed all requirements defined in 10.3.2.2. (10.4.1) □ Tank tightness test was conducted 3 to 6 months after CP was added or monthly monitoring with another leak detection system was implemented within 1 month after CP was added. Leak detection system met section 5.2.2. (10.4.2) □ Authenticated vendor-provided information was reported using the form in the Annex. (10.5)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
Invasive permanently recorded visual inspection and evaluation including external corrosion assessment	
□ Tests were conducted by or under the responsible supervision of a corrosion expert. (10.1.3) □ Stray current corrosion/interference was tested for. (10.1.4) □ Soil resistivity was measured according to Wenner 4 pin method or NACE RP-0285. (10.1.5) □ Structure-to-soil potentials were measured according to RP-0285 with at least 1 potential measurement made over each tank at the midpoint or end of all metallic components connected to the tank. (10.1.6) □ Soil pH was measured. (10.1.7) □ Electrical continuity/isolation tests were conducted (NACE RP-0187). (10.1.8) □ Additional tests were considered by the corrosion expert. (10.1.9) □ Tanks ten years old or older successfully passed the tests provided for in sections 8 and 10. (10.1.10) □ The person performing the inspection was a corrosion tester. The analysis of any suspect corrosion activity that may fail a tank was conducted by a corrosion expert. (10.4.3) □ Field and laboratory testing was completed either prior to or in conjunction with performing internal video tank inspection. If the field and lab testing revealed any indication of structural or electrochemical characteristics that were incompatible with the effective use of CP, then the tank was failed and internal inspection aborted. (10.4.4) □ The tank was emptied, cleaned, and purged prior to conducting the internal video inspection. (10.4.5 - 10.4.8.1)	□ Tests were conducted by or as directed by the corrosion specialist/cathodic protection specialist. (11.1.2) □ Stray currents were tested as specified in 9.1.2.1. (11.1.3.1) □ Soil resistivity was performed in accordance with ASTM G 57 at certain depths. (11.1.3.2) □ Structure to soil potentials were made using NACE RP-0285 with at least 5 such measurements spaced uniformly about each tank excavation zone. (11.1.3.3) □ Soil pH according to ASTM G 51 and soil chlorides and sulfides according to EPA SW846 and ASTM E 1323 were uniformly gathered from 3 locations about each tank excavation zone. (11.1.3.4) □ Electrical continuity/isolation tests were conducted according to NACE RP-0285 at each UST being evaluated. (11.1.3.5) □ The person performing the inspection was a corrosion technician. The corrosion specialist/cathodic protection specialist conducted an analysis of any suspect corrosion activity that may have failed the tank. (11.2.3) □ The field and laboratory testing was completed either prior to or in conjunction with performing the internal visual inspection. If these tests revealed any indication of structural or electrochemical characteristics that were incompatible with the effective use of CP, the tank was failed and the internal visual inspection was aborted. (11.2.4) □ Prior to conducting the internal visual inspection, the tank was emptied, cleaned, if necessary, and purged. (11.2.5 - 11.2.8.1) □ The "in-tank" visual recording system had lighting capable of adequately illuminating the interior steel surfaces so the defect sizes defined in 11.2.10.1 could be visually observed and permanently recorded. (11.2.9)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
□ The lighting equipment was capable of illuminating interior steel surfaces having an area of 12 sq ft at 30 ft from the camera. The intensity of the lighting was adjustable to accommodate the visual/video inspection within 2.5 ft of the camera. The lighting system had a minimum rating of 900 candle power. (10.4.9) □ Video camera has interchangeable lenses or zoom lens capable of focusing on surfaces from 2.5 through 30 ft away from the camera. The camera/lens/video system had sufficient viewing clarity at the maximum tank-surface-to-lens distance to identify pits or corrosion by-product tubercles having a diameter of 1/8 inch or more. The typical minimum viewing fields were 11 inches horizontal by 8 inches vertical at a distance of 5 ft and 22 inches horizontal by 18 inches vertical at 30 ft. (10.4.10.2) □ The video camera/system had certain minimum specified properties. (10.4.10.2) □ Camera focusing and light intensity were controlled remotely. The controls were capable of focusing and lighting to produce a clear sharp monitor image with sufficient contrast to identify (and tape) suspected corrosion activity throughout interior surfaces of the tank. (10.4.10.3) □ The remote-control drive mechanism was capable of the following: raising/lowering within 95% of the tank diameter, rotating right/left 360 degrees, rotating the camera tilt angularly up/down from direct down view to 135 degrees up from vertical, and identifying the direction of view. (10.4.11) □ The video monitor had (at minimum): a high-resolution industrial-grade color monitor with 9 inch diagonal color screen, resolution and clarity to be compatible with the video camera, and capability of identifying corrosion activity listed in the emergency standard. The unit included a high-resolution industrial-grade video recording system with audio microphone and audio tract capabilities. The recording system had standard video recording controls, including programmable clock/timer and an integrated video typewriter with memory. The system had the capability of superimposing both voice override and typed text on the video tape. (10.4.12) □ All interior tank surfaces were scanned with a medium-focal-length lens/zoom to assess the general inspection conditions and ensure the tank was sufficiently clean to permit effective video inspection. (10.4.13.1)	□ The visual inspection method identified and permanently recorded the presence of all detectable pits or corrosion by-products tubercles while observing and permanently recording the condition of at least 98% of the tank's interior surfaces. (10.2.10.1) □ The minimum resolution of the visual recording system was capable of identifying the location and degree of corrosion activity as listed in 11.2.10.1. The system permanently embedded the time, structure site, UST location and date of the visual examination in the visual record. It provided for permanently recording the observation comments of the visual inspector. (11.2.11) □ The inspection was made by a qualified technician working under the supervision of the responsible corrosion specialist/cathodic protection specialist according the following minimum requirements. (11.2.12) □ All interior surfaces were scanned to assess the general inspection conditions and to ensure the tank was sufficiently clean to permit effective visual inspection. (11.2.12.1) □ Date, time, and all necessary tank identification data (including company/ address, project ID, tank size, age, and ID number, and corrosion technician's name) were recorded at the start of the recording process. (11.2.12.2) □ The visual corrosion condition on at least 98% of the internal tank surfaces was systematically performed. (11.2.12.3) □ All pertinent or unique observations, corrosion activity or damage, and location relative to the internal tank surface observed by the corrosion technician were permanently recorded. (11.2.12.4) □ A commentary summation of the corrosion technician was permanently recorded. (11.2.12.5) □ The corrosion technician identified any evidence of corrosion. (11.2.13) □ The report indicated if no corrosion or deterioration was evident. (11.3.1) □ The corrosion specialist/cathodic protection specialist viewed the visual permanent record and made final determination on the suitability of each tank tested for upgrading. (11.3.2) □ A report was prepared and submitted to the O/O by the corrosion specialist/cathodic protection specialist after review of the permanent visual record. The report contained the upgrading suitability determination made for each tank. The report was kept on file by the O/O as part of required documentation. (11.3.3)

Former Emergency Standard ASTM ES 40 (Not Available)	ASTM Standard Guide G 158
□ The following were both typed in and recorded verbally at the start of the recording: date, time, and all necessary tank ID data (including company name/address, project ID number, tank size, age, and ID number, and technician's name). (10.4.13.2) □ The camera was moved systematically to record visual inspection of the internal tank surfaces. Zoom-in (or appropriate lenses) was employed to explore any suspected corrosion sites. (10.4.13.3) □ Voice override and text input was used for notations on any unique observation, corrosion activity, or damage along with the location relative to the internal tank surface. (10.4.13.4) □ Summation commentary and recommendations noting "end" of inspection using both voice and text input were added. (10.4.13.5) □ Corrosion tester identified any evidence of corrosion. (10.4.14) □ The report indicated if no corrosion or deterioration was evident. (10.5.1) □ The corrosion expert reviewed the video record and made a final suitability determination of each tank tested for upgrading. (10.5.2) □ The corrosion expert submitted a report to the O/O after reviewing the video record (including both typed-in and voice override notations and comments) which included the upgrading suitability determination made for each tank. The video record and report were kept on file by the O/O as part of the required documentation. (10.5.3) □ If significant evidence of a perforation or corrosion was confirmed by the corrosion expert or if the corrosion expert's analysis of the site environmental data indicated the tank was not a candidate for cathodic protection, the O/O was advised that the tank was not acceptable for upgrading by CP and that other options should be considered, such as repair, replacement, additional tests/inspections, or closure. (10.5.4) □ For tanks 10 yrs old or older, CP was applied only after testing in accordance with sections 8 and 10 with the tank found to be leak free. The leak detection test was performed again approximately 6 months after adding CP for tanks that were 10 yrs old or older to ensure the tank's continued leak-free condition. (10.5.5)	□ Any evidence of perforation or significant corrosion was confirmed by the corrosion specialist/cathodic protection specialist or by her or his analysis of the site corrosion data which indicated the tank was not a candidate for upgrading by CP alone. (11.3.4) □ Either: (1) A prediction model was used to determine the probability of an individual tank leak due to corrosion. The model yielded the years of leak-free life remaining and the probability of a potential leak of the tank in a specific soil condition. It was based on tank inspection data collected and included all of the site specific parameters in 11.1.3 through 11.1.3.5 along with any tests performed in 11.1.4. The mathematical formulation was based on accepted physical/electrochemical characteristics of tank corrosion process. (10.3.5.1) The tank was considered suitable for upgrading if: the results of the prediction model, as determined by the corrosion specialist/cathodic protection specialist, supported that CP was both reasonable and viable (11.3.5.1) or (2) If a statistical prediction model was not used, tanks were not considered suitable for upgrade with CP if any of the following values were as follows: soil resistivity at the average tank depth < 700 ohm-cm, soil pH < 4.0, soluble chloride ion concentration > 500 ppm, positive sulfide test indicating the presence of sulfate-reducing bacteria according to EPA SW 846, average tank-to-soil potential on the UST is more positive than minus 300 mV with respect to a saturated copper/copper sulfate electrode. (11.3.5.2) □ Tanks tested and found to be leak free and found acceptable for upgrading according to sections 8 and 11 and meeting the criteria defined in section 11.3.4 together with either section 11.3.5.1 or 11.3.5.2 could be upgraded with cathodic protection (11.4.1) □ Tank tightness test was conducted 3-6 months after CP was added or monthly monitoring with another leak detection system was implemented within 1 month after CP was added. Leak detection system met section 5.2.2. (10.4.2) □ Authenticated vendor-provided information was reported using the form in the Annex. (10.5)

Compliance Options for Tank Leak Detection and Integrity Assessment

September 14, 1998

The detailed table below is intended for implementing agencies, which may share its contents with owners and operators. The table shows what types of tank leak detection methods and alternative (without human entry) integrity assessment methods meet both EPA regulations **and** the requirements of implementing agencies that have followed EPA guidance on integrity assessment. Leak detection for piping is **not** addressed. Responses in the 1st and 2nd columns do not depend on the date that an assessment was done. If any of the conditions in the first 4 columns change, then skip to the appropriate row. Remember that tanks can always use monthly leak detection monitoring under 280.43(b) through (h).

If your agency follows EPA guidance, when conditions match these,				then for compliance the **tank** can use:		
Was **tank** installed with corrosion protection or was cathodic protection added (and if so, when)?	Does **piping** have corrosion protection and is spill and overfill protection in place?	If upgraded, is assessment 1 of following: human-entry inspection, leak detection for tanks less than 10 years old at the time, or meeting Option A or B*?	If upgraded with cathodic protection, did assessment procedure meet former ASTM ES 40?	Alternative integrity assessment (for compliance w/ 12/22/98 upgrade req't)	For Leak Detection: Inventory Control (or, if applicable, Manual Tank Gauging) + Tightness Testing, at least	
					Annually	Every 5 Years
N	Y or N	Y or N	Not App.	Not App.	Through 12/22/98	N
Y (anytime)	N	N	N	N**	Through 12/22/98	N**
		N	Y	Y **if** done on or before 3/22/98; N if after	N	N
		Y	Y or N	Y	Through 12/22/98	N
Y (**on or before** 12/22/88)	Y	N	N	N**	Through 12/22/98	N**
		N	Y	Y **if** done on or before 3/22/98; N if after	N	N
		Y	Y or N	Y	-->	Thru 12/22/98
Y (**after** 12/22/88)	Y	N	N	N**	Through 12/22/98	N**
		N	Y	Y **if** done on or before 3/22/98; N if after	N	N
		Y	Y or N	Y	--->	10 yrs after tank upgraded w/ corr. prot.

* Option A or B (from EPA's 7/25/97 guidance): Option A is accordance with a current standard code of practice developed by a nationally recognized association or independent test lab. In Option B, a procedure must meet certain performance criteria in a third-party evaluation (see the "List of Integrity Assessment Evaluations," available from EPA OUST, for example procedures).

** Unless an alternative integrity assessment method was determined by implementing agency to be no less protective under 40 CFR 280.21(b)(2)(iv), the assessment method and thus the upgrade do not meet 12/22/98 standards.

Flyer Designed For UST Owners

Those UST owners who face the decision of choosing which integrity assessment procedure to use should be made aware that they will need proof that their choice of an alternative integrity assessment meets compliance requirements. We will use variations of the “canned language” below to alert UST owners to this issue—we hope you will do the same in your newsletters or other periodic communications with UST owners you are involved with.

Owners Upgrading USTs:
Make Sure Your Alternative Integrity Assessment Has “Integrity”

Before you upgrade a steel underground storage tank (UST) with cathodic protection, make sure that the procedure your contractor uses to assess the tank’s integrity is acceptable. To find out which procedures are acceptable, check with the government agency that implements the UST program in your area (usually your state environmental agency). Most implementing agencies have followed the U.S. Environmental Protection Agency’s recommendation to allow contractors to use alternative integrity assessment procedures only if they can provide you with at least one of the following:

- Written proof that the standard operating procedure used conforms to a national code of practice. The current code is ASTM G 158, but check with your implementing agency to see if any other codes are currently acceptable.

- A signed independent third-party evaluation that shows the procedure has been able to detect 95% of unsuitable representative USTs in a blind evaluation.

With one or both of these evidences of “proof,” you can make sure the hard-earned dollars you spend on upgrading will bring

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

JUN 25 1998

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Guidance Regarding the ACT-100-U® Tank Technology

FROM: Anna Hopkins Virbick, Director
Office of Underground Storage Tanks

TO: State UST Program Managers
EPA Regional Program Managers

Introduction

Pursuant to a request from the Steel Tank Institute (STI), the Environmental Protection Agency (EPA) is providing guidance regarding a newer composite tank technology called the ACT-100-U®. This technology is similar to the new tank standard at 40 CFR § 280.20(a)(3) which describes one acceptable tank as being constructed of a steel-fiberglass-reinforced-plastic composite. The difference with the ACT-100-U® technology is that it is constructed of a steel-polyurethane composite. Therefore, the newer ACT-100-U® technology does not meet the regulations at § 280.20(a)(3) because the cladding is not fiberglass-reinforced-plastic (FRP). However, when the underground storage tank (UST) regulations were written, flexibility for new and emerging tank technologies was provided for at § 280.20(a)(5). It is here where the ACT-100-U® tank technology may fit into the UST regulations.

Recommendation

EPA recommends that implementing agencies determine that the ACT-100-U® tank technology is designed to prevent the release or threatened release of any stored regulated substance in a manner that is no less protective of human health and the environment than those tanks already specifically listed in the regulations.

Discussion

EPA recommends that implementing agencies make this determination based upon the following information:

1. Underwriters Laboratories (UL) Listing

The ACT-100-U® has received a third party listing issued by UL (see attachment 1) dated 6/5/96 as a coated composite tank for flammable liquids (UL 1746). The tank is fabricated by coating a tank listed under UL 58 with a polyurethane coating. The coating material passed the same tests as the ACT-100® FRP coating under UL 1746 part II requirements. Note: UL is in the process of finalizing testing criteria (to be called UL 1746 part IV) specific to ACT-100-U® coating. The following tests were performed by UL on coupon samples containing a minimum 70 mil thick polyurethane coating:

Accelerated Air Oven Aging Testing
Immersion Testing
Light and Water Exposure Testing
Abrasion Resistance Testing
Impact and Cold Exposure Testing
Corrosion Evaluation Testing
Identification Testing
Strength of Pipe Fittings Testing (both bending moment and torque)
Strength of Lift Fittings Testing
Tank Impact Testing
Tank Examination and Holiday Testing

2. ACT-100-U® Specification

STI has prepared an ACT-100-U® Specification for External Corrosion Protection of Composite Steel Underground Storage Tanks (see attachment 2). The purpose of this specification is to establish ACT-100-U® production procedures which are fully supported by quality assurance measures and proper installation requirements. The specification contains information regarding a specific method of underground external corrosion control for steel tank. It includes requirements for fabrication and performance, electrical isolation, approved resins, and cladding application.

3. Installation Instructions

STI has written installation instructions (see attachment 2, appendix K) which are specific to the ACT-100-U® tank technology. These instructions provide for the inspection and repair of any coating damage, electrical isolation of the tank, and detailed instructions for the installation of the tank.

4. Side-By-Side Comparison of ACT-100-U® with ACT-100® (National Association of Corrosion Engineers (NACE) International Paper No. 583 Presented at the Corrosion 97 Conference)

A paper (see attachment 3) titled "21st Century Underground Steel Tank Protection Today" was presented at the NACE International Conference in 1997. This paper provides information regarding the testing of the polyurethane coating along with a side-by-side comparison of the ACT-100® and ACT-100-U® tank technologies. One Environmental advantage that the paper discusses for the ACT-100-U® is that the polyurethane coating is 100% solids and does not contain amines, styrenes, or volatile organic compounds (VOCs).

Note: The NACE paper contains some information regarding cathodic disbondment resistance and flexibility for the polyurethane coating. This information was obtained from UL testing conducted in 1993 (see attachment 4) on coating samples that ranged from 12 to 31 mils in thickness and is not part of the UL 1746 listing.

Please contact Paul Miller of my staff via E-mail at miller.paul@epamail.epa.gov or phone at (703) 603-7165 if you have questions regarding this guidance.

Attachments (4)

cc (w/o attachments): Wayne Geyer, Steel Tank Institute
David Wiley, OUST
OUST Management Team

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

AUG 5 1998

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Clarification and Guidance Regarding Cathodic Protection/Monitoring of Double-walled Steel USTs

FROM: Anna Hopkins Virbick, Director
Office of Underground Storage Tanks

TO: State UST/LUST Program Managers
Regional Program Managers

Introduction

On July 18, 1991, a technical interpretation was issued from this office (attached) to Mr. Charles Frey of the Highland Tank and Manufacturing Company regarding, in part, the issue of whether or not the federal regulations at 40 CFR Part 280 require cathodic protection (CP) monitoring of double-walled underground storage tanks (USTs), where both walls are made of steel. Since its issuance, this correspondence has generated some confusion and concern. Today's memorandum clarifies the Environmental Protection Agency's (EPA's) position on this matter and provides guidance to implementing agencies.

Discussion

A. Corrosion protection

The July 18, 1991 letter appears to have left some readers with the incorrect impression that double-walled steel tanks are not required to have corrosion protection. It is EPA's position that **all** tanks, including double-walled steel tanks, must be protected from corrosion according to the federal regulations for new tanks at § 280.20 and for existing tanks at § 280.21. This position is supported by the regulatory language at § 280.20(a) which states:

> Each tank must be properly designed and constructed, and any portion underground that routinely contains product must be protected from corrosion....

By saying "any portion underground," the regulations are referring to any portion **of the tank** that is underground. A double-walled tank has an inner and outer wall, both of which are considered part of one single tank. Therefore, any portion of the tank (meaning both the inner and outer wall in the case of a double-walled tank) that is underground and routinely contains product must be protected from corrosion. A steel inner wall is protected from corrosion by an intact outer wall, while the outer wall is protected from corrosion using one of the methods listed at § 280.20(a). This position is also supported by § 280.21 which requires all existing tanks that do not meet new tank standards or closure requirements to add corrosion protection by December 22, 1998. Corrosion protection options for existing steel tanks include internal lining, cathodic protection, and internal lining combined with cathodic protection.

B. Cathodic Protection Monitoring With Respect to Inner and Outer Tank Walls

In addition, the July 18, 1991 letter to Mr. Frey of Highland Tank discusses CP monitoring with respect to inner and outer tank walls — the outer wall is in contact with the ground while the inner wall routinely contains product. The letter states:

> In a double-walled steel tank the inner wall of the structure contains the product but it is protected from external corrosion by the outer wall. **Thus, cathodic protection monitoring of the outer wall is not required under EPA regulations**.

(emphasis added).

The second sentence of the above statement is incorrect. For a cathodically protected double-walled steel tank, the inner wall is protected from corrosion by the outer wall while the outer wall is protected from corrosion by the cathodic protection system. It is the EPA's position that both inner and outer walls are part of a single UST system. According to § 280.31(b):

> All UST systems equipped with cathodic protection systems must be inspected for proper operation by a qualified cathodic protection tester in accordance with the following requirements....

The requirements discussed following this statement in the regulations include the test conducted within six months of installation and every three years thereafter and 60 day inspections of impressed current systems. Therefore, since the outer wall of a double-walled tank with cathodic protection is part of the UST system, that cathodic protection **must** be inspected for proper operation in accordance with § 280.31.

C. Cathodically Protected Double-Walled Steel Tanks with Interstitial Monitoring

The issue that prompted Highland Tank to approach the EPA was whether the protection afforded by the triennial CP monitoring requirement at § 280.31(b) could be achieved in an alternative way for cathodically protected double-walled steel tanks. Its position was that using interstitial monitoring for release detection on a cathodically protected double-walled tank should be accepted by EPA as a technically equivalent substitute. It pointed out that the inner wall of a protected double-walled tank is shielded from external corrosion by the protected and coated outer wall, and in the unlikely event that corrosion should breach the outer wall, it would be detected by the interstitial monitoring system before external corrosion could significantly damage the inner, primary-containment wall. Highland Tank's basic justification for this position was its belief that these tanks are more protective than cathodically protected single-walled steel tanks and that CP monitoring was unnecessary and duplicative when interstitial monitoring was used with the double-walled tank.

EPA agrees that cathodically protected double-walled steel tanks with interstitial monitoring capable of detecting a breach in both the inner and outer wall are very protective of human health and the environment. Therefore, we reviewed the language in the regulations to determine whether cathodic protection monitoring flexibility was allowed in this case. The following are our findings.

> One of the regulatory requirements for steel tanks with cathodic protection is that CP systems are operated and maintained according to § 280.31 or according to guidelines established by the implementing agency (§ 280.20(a)(2)(iv)). In addition, § 280.31(b)(1) requires all UST systems equipped with CP be tested within six months of installation and at least every three years thereafter or according to another reasonable time frame established by the implementing agency. These requirements apply to both new and existing UST systems. In addition, implementing agencies are given the flexibility to establish guidelines alternative to those specifically listed in the regulations.

Based on these findings, EPA recommends that implementing agencies use this flexibility and establish the following criteria and guideline.

If an UST meets **<u>all</u>** of the following criteria:

1. Double-walled tank, both walls made of steel.
2. Cathodically protected.
3. Interstitial monitoring capable of detecting **<u>one</u>** of the following:
    a) a breach in the inner and outer tank walls.
    b) an ingress of product and water into the interstitial space.

Examples of interstitial monitoring which satisfy the third criterion are a vacuum monitor, a liquid-filled interstice with level monitoring, a float sensor that reacts to both water and product, or monthly manual sticking of the interstice. An example of interstitial monitoring which does not satisfy the third criteria is a sensor capable only of detecting either product (like many vapor sensors) or water. Different sensors can be combined to meet the criterion.

Then apply the following guideline:

> Require the CP monitoring time frame to be within six months of installation of the CP system and after any activity that might affect the CP system (some examples include but are not limited to: retrofit activity, excavation close to the UST, or maintenance that might affect the rectifier).
>
> Note: This guideline applies to new tank installations and to existing tanks that meet the criteria listed above and have at least one cathodic protection monitoring event as specified at § 280.31(b). For those tanks that have never been subjected to a cathodic protection monitoring event, EPA recommends that a monitoring event be performed according to § 280.31(b) prior to applying this guideline.

If any one of the criteria are no longer met, then this recommendation no longer applies and triennial monitoring of the cathodic protection system is necessary.

The initial monitoring of the CP system ensures that the UST system is being protected from corrosion following installation while monitoring after any activity that could affect the CP system addresses any potential problems that occurred because of that activity. Implementing agencies have the flexibility to determine the specific activities that would trigger a monitoring event. In addition, the interstitial monitoring will detect a wall breach or ingress of product and water, allowing the problem to be fixed before any regulated substance can be released into the environment. EPA cannot recommend the guideline of "no monitoring" for a CP system on a double-walled steel tank because we do not believe that "no monitoring" can be considered "another reasonable time frame," which is specified at § 280.31(b)(1). Please note that the 60-day inspection requirement for impressed current CP systems is still required because it falls under a different section of the regulations (§ 280.31(c)).

EPA believes that periodic monitoring of cathodic protection systems on all steel USTs is a good tank management practice. However, we do not believe that significant additional protection to human health and the environment is gained by requiring cathodic protection monitoring every three years on tanks that meet the criteria described in this recommendation.

Summary

The following summarizes the key points in this memorandum:

1. Corrosion protection is required for all USTs.

2. The inner and outer walls of a tank are considered part of a single UST system and any cathodic protection attached to the outer wall must be inspected for proper operation according to the regulations at § 280.31.

3. For cathodically protected double-walled steel tanks that use interstitial monitoring capable of detecting a wall breach or ingress of product and water, EPA recommends that implementing agencies use the flexibility allowed in the regulations and require the CP monitoring time frame to be within six months of installation and following any activity that could affect the CP system.

The above memorandum supersedes information contained in our previous regulatory interpretation regarding CP monitoring requirements for double-walled steel tanks dated July 18, 1991. Please contact Paul Miller of my staff via E-mail at miller.paul@epa.gov or phone at (703) 603-7165 if you have further questions regarding this matter.

Attachment

cc: Wayne Geyer, STI
OUST Management Team
David Wiley, OUST
Paul Miller, OUST
RCRA/UST Hotline

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 23, 1999

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Guidance Regarding Cathodic Protection Monitoring of ACT-100® and ACT-100-U® Underground Storage Tanks with Cathodic Protection

FROM: Anna Hopkins Virbick, Director /s/
Office of Underground Storage Tanks

TO: State UST Program Managers
EPA Regional Program Managers

Pursuant to a request from the Steel Tank Institute (STI), the Environmental Protection Agency (EPA) is providing guidance regarding the cathodic protection (CP) monitoring of two underground storage tank (UST) technologies. The ACT-100® and, where accepted by implementing agencies according to EPA guidance dated June 25, 1998, ACT-100-U® tank technologies meet new tank standards at § 280.20 without the addition of cathodic protection. These tanks are corrosion protected by an external cladding which provides a dielectric barrier between the steel tank and the environment. As long as the integrity of the cladding is maintained, the addition of anodes to these types of tanks at installation provides an additional level of corrosion protection that is beyond the minimum requirements described in the federal regulations.

STI recently published a supplement to the installation instructions dated March 1998 for the ACT-100® and ACT-100-U® tank technologies (see attachments) that provides specific instructions for attaching factory-attached and field-attached anodes. Factory-attached anodes must be attached per the requirements of the STI-P3® specification and weld-on anode core bars must be coated at the factory according to the ACT-100® or ACT-100-U® specifications. For field-attached anodes, the anode wire must be connected to the lift lug or something which by design is not in contact with stored product. Instructions for wire connections and splices are also included. EPA believes that the installation instruction supplements and specifications ensure the integrity of the cladding is maintained. Historically, the ACT-100® specification (as far back as 1989) required complete cladding coverage over the entire tank, any external attachments must be designed in a manner which does not preclude the proper application of the cladding material, and a spark test must be conducted over the entire surface of the tank after application of the cladding.

EPA believes that anytime CP is installed on an UST system, it should be operating properly. However, ACT-100® and, where accepted, ACT-100-U® tank technologies meet new tank standards without the addition of anodes. In addition, by following STI's March, 1998 installation instructions, tank manufacturers employ good tank management practices by requiring an initial test of the CP system and additional testing when construction or maintenance activity around the tank or anodes takes place.

Based upon the above discussion, EPA believes that monitoring of ACT-100® and, where accepted by implementing agencies, ACT-100-U® tanks with anodes should not be required. EPA recommends that implementing agencies determine the following for ACT-100® and, where accepted by implementing agencies, ACT-100-U® tanks:

Periodic monitoring of cathodic protection systems is not required in the following cases:

1. When factory installed anodes are included with a new ACT-100® or ACT-100-U® installation.

2. When field installed anodes are included with a new ACT-100® or ACT-100-U® installation.

Note: In cases where cathodic protection is retrofitted to a previously installed ACT-100® or ACT-100-U® tank, cathodic protection monitoring is required because the status of the cladding cannot be determined.

Please contact Paul Miller of my staff via E-mail at miller.paul@epa.gov or phone at (703) 603-7165 if you have questions regarding this guidance.

Attachments (2)

cc (w/o attachments): Wayne Geyer, Steel Tank Institute
David Wiley, OUST
OUST Management Team
Kathy Nam, OGC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 8, 1999

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: Guidance Regarding a New Recommended Practice for Inspecting Internally-Lined Tanks

FROM: Sammy K. Ng, Acting Director /s/
Office of Underground Storage Tanks

TO: State UST Program Managers
EPA Regional Program Managers

A new recommended practice has been developed by Ken Wilcox Associates (KWA), Inc. titled ***Recommended Practice for Inspecting Buried Lined Steel Tanks Using a Video Camera*** (see attachment 1). Until this standard was developed, the Environmental Protection Agency's (EPA) Office of Underground Storage Tanks (OUST) was aware of only one standard, National Leak Prevention Association (NLPA) Standard 631, Chapter B, that described a procedure for the periodic inspection requirements for internally-lined underground storage tanks (USTs).

The Federal regulations at 40 CFR ∮ 280.21(b) require the following when a periodic inspection of an internally-lined tank is conducted:

1. The inspection of the lined tank must be conducted in accordance with a code of practice developed by a nationally recognized association or independent testing laboratory.

2. The lined tank is internally inspected and found to be structurally sound with the lining still performing in accordance with original design specifications.

How does the KWA recommended practice meet each of these requirements? First, the newly developed recommended practice is a standard developed by KWA, Inc., an independent testing laboratory. Second, the KWA recommended practice performs an internal inspection by use of a video camera. Third, the recommended practice determines whether or not the lined tank is structurally sound by using tank and site-specific data and a mathematical prediction model to statistically determine the expected leak-free life of the tank. Finally, the recommended practice determines whether or not the lining is still performing in accordance with original design specifications by conducting a tightness test and performing hardness and thickness testing in areas below the fill riser. A detailed comparison of the lining inspection requirements for each of the standards is provided in attachment 2.

After careful review of the KWA recommended practice, comparison to the NLPA standard and review of the federal regulations, EPA believes that the KWA recommended practice meets the requirements necessary for conducting inspections of internally-lined tanks as required in the federal regulations at 40 CFR § 280.21(b). In addition, EPA recommends that states review the recommended practice to determine if it meets their lining inspection requirements, if applicable under state law. EPA recognizes that states may decide not to allow use of the KWA recommended practice for the periodic inspection of internally-lined tanks under state law.

Please contact Paul Miller of my staff via E-mail at miller.paul@epa.gov or phone at (703) 603-7165 if you have questions regarding this guidance.

Attachments (2)

cc (w/o attachments): Paul Miller, OUST
OUST Management Team
Shushona Clark, Compendium
Kathy Nam, OGC
Ken Wilcox Associates, Inc.

Attachment 2 - Comparison of NLPA 631 and the KWA Standard

Regulatory Requirement	NLPA 631, Chapter B	KWA Recommended Practice
Code of practice is developed by a nationally recognized association or independent testing laboratory	NLPA 631, Chapter B, ***Future Internal Inspection Requirement for Lined Tanks***, copyright 1991, developed by the National Leak Prevention Association, date standard last revised, unknown (OUST received a version in early calendar year 1999 that was changed from the previous version, however, it had no revision number or date). - In the original EPA regulations, NLPA is a nationally recognized association.	***Recommended Practice for Inspecting Buried Lined Steel Tanks Using a Video Camera***, Dated September 28, 1999, First Edition, prepared by Ken Wilcox Associates, Inc. - Ken Wilcox Associates, Inc. is an independent testing laboratory
The tank is internally inspected	***visual inspection*** - for evidence of peeling, blistering, surface wrinkling or roughening of the lining material. Imperfections in the lining shall be repaired in accordance with the lining material manufacturers specifications.	***permanently recorded internal inspection with video camera*** - at least 98% of tank surface must be inspected to pass. - camera must be able to detect presence of problems at least as small as 3/32 inch at the maximum operating distance from the camera. - identify any evidence of separation, delamination, blistering, holidays, peeling, thin areas, surface wrinkling or roughing, cracking, pin holes, or other visible condition that indicates a problem. - any evidence of a perforation or any of the problems listed above, confirmed by the specialist fails the lining.

Regulatory Requirement	NLPA 631, Chapter B	KWA Recommended Practice
The lined tank is structurally sound	***Ultrasonic thickness testing of the tank shell*** - Grid the tank into 3 ft. X 3 ft. sections and perform one ultrasonic thickness test at the center of each section. If a reading is obtained that is 75% or less of the original wall thickness, divide the 3 ft X 3 ft section into 9 subsections and take ultrasonic thickness readings of each of the 9 subsections. Average these 9 readings and record that value as the thickness reading for that section. Repairs can be made to the area if the average is less than 75% of original wall thickness. - Determine the average wall thickness of the tank. - If average wall thickness is less than 75%, then the tank fails. - If average wall thickness is 75% - 85%, cathodic protection must be added within 1 year of the inspection date. - If average wall thickness is >85%, then tank passes this part of inspection.	***A mathematical prediction model is used to statistically determine the expected leak free life of the tank*** - must yield years of leak-free life remaining and the probability of a potential leak of the tank in the specific soil condition found at the site. It shall be based on tank inspection data collected and shall include, at minimum, stray currents, soil resistivity, structure-to-soil potential, soil pH, electrical continuity/isolation, along with any other tests the specialist deems necessary. The mathematical formulation used in the prediction model must be based on accepted physical and electrochemical characteristics of the tank corrosion process. - The tank is considered structurally sound if all of the following are met: 1) the tank is not leaking. 2) results of the prediction model indicate that the age of the tank is less than the expected leak-free life. 3) the probability of a corrosion perforation is less than 0.05.

Regulatory Requirement	NLPA 631, Chapter B	KWA Recommended Practice
The lining is performing according to original design specifications	***hardness testing*** - is required, but standard does not specify test location or number of tests required. - hardness must meet manufacturers specifications for product storage (The manufacturer's specifications are not stated in the standard. However, note that section A4.7.1 of NLPA 631 does state that for linings that have been successfully in service for 5 years in underground tanks, the manufacturer of the lining may document the compatibility of the lining to the product to which the lining has been exposed. Part of the inspection for compatibility is that the lining retains a minimum of 50% original cured hardness to meet compatibility requirements). ***thickness testing*** - is required, but standard does not specify test location or number of tests required. - lining thickness must be a nominal thickness of 125 mils with a minimum thickness of 100 mils. ***holiday testing*** (also referred to as an internal inspection tightness test in the standard) - conducted at a rate of 100 V/mil of nominal lining, but not less than 12,500 V and not more than 35,000 V. - any holidays detected must be repaired. - there can be no holidays detected in the lining on the final test.	***hardness testing*** - minimum of 5 readings below fill riser - 1 reading directly below opening, 4 readings at least 10 inches offset from the centerline, outside any influence of the striker plate. - minimum 50% original cured hardness needed to pass. ***thickness testing*** - minimum of 5 readings below fill riser - 1 reading directly below opening, 4 readings at least 10 inches offset from the centerline, outside any influence of the striker plate. - minimum 100 mil thickness needed to pass. ***tightness testing*** - 0.1 gph tank tightness testing. -failure of the tightness test requires human entry.

Regulatory Requirement	NLPA 631, Chapter B	KWA Recommended Practice
Other requirements relating to the inspection of internally-lined tanks specified in the standard	- confined space entry certification and safety training of employees certification required. - inspection affidavit required.	- specialist must certify to tank owner/operator that personnel performing assessment work on the tank are knowledgeable of all applicable procedures in this practice and that all work was performed in strict accordance with this practice. - a preliminary site survey must be conducted - visual record and report must be submitted to the UST owner/operator. - independent third party evaluation required. - evaluation of video equipment. - comparison to manned entry inspection. - 50 consecutive tank inspections required where video and manned entry inspections are used.