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To protect, promote & improve the health of all people in Florida through integrated state, county & community efforts.

Florida HEALTH

Ron DeSantis
Governor

Vision: To be the **Healthiest State** in the Nation

MEMORANDUM

INFORMATION
DCEH 2019-003 REVISED

DATE April 26, 2019

TO County Health Department Directors/Administrators
Environmental Health and Engineering Directors

THROUGH Kendra F. Goff, PhD, DABT, CPM, CEHP, State Toxicologist & Chief
Bureau of Environmental Health

FROM: Ed Barranco, MPH, CEHP, CPM, Environmental Administrator
Onsite Sewage Programs

SUBJECT: Revised OSTDS Secured Tank Lids and Required Inspections

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This memorandum revises and replaces DCEH 2019-003. The purpose of this memorandum is to address questions related to secured septic lids prior to and during the construction and final inspections of an onsite sewage treatment and disposal system (OSTDS).

Contractors are required by insurance companies to secure septic tank lids after installation at the job site, to limit liability, including prior to both construction and final inspections. In general, tank lids are secured by their own weight (58-pound concrete access lids), or by screws and latches and screws, including uncommon screw heads, for plastic or fiberglass tanks.

Notwithstanding the insurance company requirement for securing tank lids, the Department staff must NOT request or require contractors to leave access lids unsecured and unattended. However, staff must be able to view the inside of the tank to validate the appropriate installation of filters, tank joints seal, structural integrity and cracks, baffle, filters and more. Staff must either be trained and equipped to access tanks to perform a thorough inspection or the contractor can be requested to provide access to the tank. If your office has not already established a system, please work with your local contractors to establish a system that works for both parties, regarding access to the tank for inspection.

To access concrete tanks, the concrete access lid need to be removed. Removing the concrete access lid will require proper training on the use of a device to lift the lid ergonomically. There are different styles of lid lifters and each offers different ergonomic protections to the user. When selecting a lid lift, please see the attach *Ergonomic Evaluation of Septic Tank Access Port Lifting Report* for information regarding various tank lift types and their associated risks for users. Please note, equipment information on concrete access lid lifters will be added to the next revision of the Environmental Health Program Manual 150-4, Chapter K, Onsite Sewage Treatment and Disposal.

To access plastic and fiberglass tanks, the access lid need to be removed. Plastic and fiberglass tank lids are generally secured by screws and latches and screws, including uncommon screw heads.

Florida Department of Health
Division of Disease Control & Health Protection • Bureau Environmental Health
4052 Bald Cypress Way, Bin A-08 • Tallahassee, FL 32399
PHONE: 850/245-4250 • FAX: 850/487-0864
FloridaHealth.gov

Removing and replacing plastic and fiberglass tank lids, will require proper tools and training on use of these tools.

It is recommended for cases where contractors will install or have installed tanks with access lids staff is unable to access, for staff to pre-arrange with the contractor for a time when the access lids can be removed and the tank made available for inspection.

Please re-distribute this revised memo to your local septic contractors. If you have questions, please call the OSTDS Section at 850-245-4250.

EB/re
Enclosure

Ergonomic Evaluation of Septic Tank Access Port Lifting

Robert B. Walton
Thomas E. Bernard
College of Public Health
University of South Florida
Tampa FL 33612-3805
(813) 974-6629 // tbernard@health.usf.edu

Summary
Inspectors must lift the access port covers from septic tanks for internal inspections. These covers may weigh up to 95 pounds and thus represent a risk factor for back disorders. Occupational health specialists from the University of South Florida reviewed the risks associated with lifting the covers using a short hook, a long hook, and a leverage device. While the leverage device was clearly preferable to either hook, improvements could be made. The USF team recommends a lever method based on 46-inch lever. An adjustable chain with a maximum length of 27 inches at the center of the lever bar would allow a tall inspector to reach a depth of 12 inches and allow the lift around waist height. A pivot plate at the base of the lever will allow the device to slide more easily on the ground for positioning during the lift, swing and replacement maneuvers.

Introduction
A representative of the State Department of Health Bureau of Water and Onsite Sewage Projects asked faculty in the University of South Florida College of Public Health Department of Environmental and Occupational Health to consider the risks of lifting concrete access ports on septic tanks. Specifically, what are the risks associated with the lifting methods currently utilized by inspectors and what might be recommended improvements.

On January 25, 1999, a multidisciplinary team of ergonomists, occupational health nurses and an occupational health physician from University of South Florida College of Public Health conducted a field assessment of lifting tasks associated with septic tank inspections. The team was accompanied by three employees of the Department of Health, representing the central office and Hillsborough and Pasco Counties. Currently, inspectors use at least three different pieces of equipment to assist with access port removal and replacement.

Because the lifts are relatively infrequent, the appropriate ergonomic analysis is a biomechanical evaluation. The analysis focuses on both ends of the anthropometric spectrum (range of body sizes from a small woman to large man) in order to determine the lifting method incorporating the widest acceptable range.

Methods

a. <u>Lifting</u>: Inspectors average four lid lifts per day with a maximum of 10. The maximum weight of the lid is 95 lbs. and its depth ranges from 4 in. to 12 in. below the ground surface. Personnel currently use three pieces of equipment for lifting the septic tank port lids (lid) based on two separate lift principles: Straight lift and carry with a long or short hook, or a lift and rotate with a lever bar. The specifics for each piece method follow.

i. Short Hook: This device consists of a 10-in. metal handle with a 16.5 in. long hook welded to the middle of the handle (see Appendix A for picture). Inspectors "hook" the lid and manually lift it and take a step to the side before setting it down. The typical posture is a freestyle lift (bent at knee and waist) with the arms straight, hands about three inches. in front of ankles and six inches. apart. The degree of knee and waist bend is a function of that person's anthropometry and the depth of the lid. Note that the full weight of the septic tank lid must be lifted and moved.

ii. Long Hook: This device is identical to the short hook except its hook is 30.5 in. long (see Appendix A for picture). Again, the full weight of the lid is lifted. For a similar sized person, they will be more up-right.

iii. Lever Bar: This device consists of a 46-in. long bar (pivot point on ground to handle) with a 7.5 in. chain hook located approximately in the middle of the bar (26 in. from pivot point). Inspectors place the bar end (pivot point) on the ground and lower the handle end until the chain can "hook" the lid. The handle is then raised to lift the lid. The typical posture requires bending at knee and waist with the arms straight, hands three inches. in front and together (see Appendix A for picture). The degree of knee and waist bend is a function of that person's size and the depth of the lid. Note that in this case, the bar operates as a second-class lever and effectively reduces the actual force that must be exerted. While a second-class lever follows the basic principle of reducing the "effective load", it increases the distance traveled. The load is reduced by the ratio of distance from the pivot point. In our case, the "effective load" is the actual load (95 lbs.) times the ratio of 26/46 and equals 54 lbs. However, to lift the lid 12 in. requires the handle to be moved 12 x (46/26) 21 in.

b. Evaluation: Each of the lifting tools were evaluated using the widely accepted University of Michigan Static Strength Modeling Program. The preferred posture for each lift was determined based on the hand locations required for the lift and the anthropometry of the person. The goal is to have one tool that all persons could safely utilize. To that end, we evaluated each tool for the "small person" anthropometry (5th percentile woman) and the "large person" anthropometry (95th percentile man). The modeling program based on input values for hand location, load weight, and anthropometry calculated expected joint strength requirements and lumbar compressive forces for the lift. Based on expected strength requirements, the program determined the percent of population capable. The parameters used to define tool acceptability were back compressive forces < 770 lbs. (NIOSH limit) and approximately 95 % of population capable. Additionally, each tool was evaluated at the minimum and maximum lid depth below ground, of 4 and 12 in.

Evaluation Results

a. <u>Long Hook</u>: The load used for all calculation was the maximum observed lid weight of 95 lbs. with equal weight distribution in each hand.

i. <u>Minimum Depth</u>: The 5th percentile woman should not exceed the back compressive force limit during the lift (493 lbs. compressive force); however, because it is so long only 1% of the population would have sufficient shoulder strength to perform the lift. The 95th percentile man would have the strength (limiting joint hip 89%) but the back compressive force is very close to the NIOSH limit (718 + 49 lbs.). Refer to Appendix B for complete individual results.

ii. <u>Maximum Depth</u>: As would be expected for this specific tool, the increased depth provides a better lifting posture for the 5th percentile woman and as a result the compressive force is 593 lbs. and the limiting strength is hip at 82% capable. As would follow, this lifting posture would not be as good for the 95th percentile man and as a result the compressive force is 1091 lbs. with a limiting strength of 78% at knee, shoulder and hip. Refer to Appendix B for complete individual results.

b. Short Hook: The load used for all calculation was the maximum lid weight of 95 lbs. with equal weight distribution in each hand.

   i. Minimum Depth: This tool would fit the 5th percentile woman better, so more would have the strength (limiting shoulder at 61% capable); however, the compressive force is unacceptable 918 + 65 lbs. As would be expected, the tool would not fit the 95th percentile man very well; he would have the strength (limiting joint is the hip at 86%) but the back compressive force is very high (1338 lbs.). Refer to Appendix C for complete individual results.

   ii. Maximum Depth: The compressive forces for both the 5th percentile woman and the 95th percentile man are unacceptable at 955 and 1419 lbs. respectively. Refer to Appendix C for complete individual results.

c. Lever Bar: The load used for all calculation was the maximum force of 54 lbs. (for the 95 lbs. Lid) with equal weight distribution in each hand.

   i. Minimum Depth: Strength is not a significant issue with the limiting strength of women at the hip being 86% acceptable. The 5th percentile

   woman should not exceed the back compressive force limit during the lift (593 lbs.). However, because of the required posture, the 95th percentile man exceeds the back compressive force limit (973 lbs.). Refer to Appendix D for complete individual results.

   ii. Maximum Depth: The increased depth just makes this device worse for both men and woman. The 5th percentile woman's back compressive force increases to 679 lbs. while for males it increases to 1125 lbs.

Recommendation

Of the three methods evaluated, the lever bar clearly stands out as the method of choice. With the proper posture, this method produced the lowest back compressive forces while retaining a large percent capable in the strength requirement analysis. The results have clearly shown that a range of dimensions reflective of adjustability is an essential requirement in finding one tool that could be safely used by most inspectors. The use of a second-class lever system demonstrated the most significant potential. It reduced the strength requirements making it acceptable for most women while still limiting the back compressive forces generated. Appendix E has complete results for using the lever bar at the optimum height levels (33 in. for men, 25 in. for women). The recommended new design is really just a minor modification of the lever bar currently being used. The chain length should be increased from 7.5 in. to 27 in with a provision for adjusting the length, such as an S-hook so the chain length can be "hooked" at the necessary length to provide the optimum posture during lifting. A pivot plate at the base of the lever will allow the device to slide more easily on the ground for positioning during the lift, swing and replacement maneuvers.

Appendix A