

Study Guide

for

Pennsylvania

Underground Storage Tank

Certification Exams

HOW TO USE THIS STUDY GUIDE

This study guide is intended to help individuals prepare for the <u>technical</u> portion of Pennsylvania's underground storage system tank handler certification examinations. There is a separate study guide to help applicants prepare for the administrative examination. The study guide consists of an extensive list of questions. All of the questions based on material in a specific document are grouped together in the study guide. After each question, the section or page in the reference document where the answer to the question can be found is given in parentheses. The process of reading the question, finding the answer in the reference document and writing the answer in your study guide will help individuals learn the necessary information to pass the certification examinations.

The certification exam will include the material covered in these study questions. The only difference is that the exam will be in multiple choice format. Be thoroughly familiar with the material in this study guide before entering the examination room. The study guide or any other reference material may not be referred to while taking the technical portion of the certification examination(s).

The number of underground storage system certification categories in Pennsylvania has been increased to five. The relationship between the examination modules that you must pass and the certification categories is as follows:

EXAM MODULE	CERTIFICATION CATEGORY
UX	UMX – INSTALLATION & MODIFICATION OF UNDERGROUND STORAGE SYSTEMS UMI – MINOR MODIFICATION OF UNDERGROUND STORAGE SYSTEMS
UR	UMR – removal of underground storage systems
IU	IUM – INSPECTION OF UNDERGROUND STORAGE SYSTEMS
UT	UTT – TESTING OF UNDERGROUND STORAGE SYSTEMS

For a complete description of the certification categories and the certification requirements for each category, refer to Pennsylvania Code Title 25, Chapter 245.110-113.

This study guide contains questions that are applicable to all four certification examinations. The exam module code letters listed in the above table are printed to the left of each study guide question. The exam module code letters identify the certification examinations which may contain questions related to the study guide question. For example, if the letters UX and IU appear next to a study guide question, then the information covered in the study guide question may appear in the UX and the IU exam modules. If taking either of these exams, know the answer to this study guide question. If preparing for the UR examination, skip this question as the material is not relevant to the examination.

Study questions for the Storage Tank-Liner (TL) exam can be found in the "Study Guide for Pennsylvania Aboveground Storage Tank Certification Exams."

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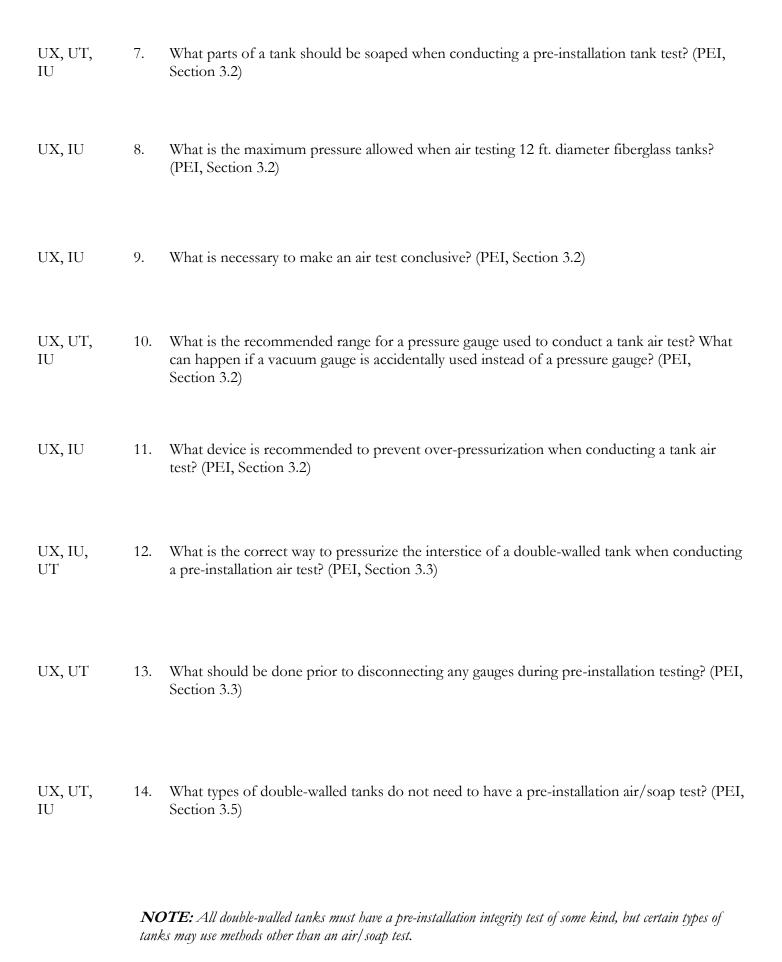
Document
Petroleum Equipment Institute PEI RP – 100: Recommended Practices for Installation of Underground Storage Systems
Containment Solutions Fiberglass Storage Tank Installation Instructions & Operating Guidelines
American Petroleum Institute API 1615: Installation of Underground Petroleum Storage Systems
American Petroleum Institute API 1632: Cathodic Protection of Underground Storage Systems
NACE International NACE SP0285: Corrosion Control of Underground Storage Tank Systems by Cathodic Protection
Pennsylvania Department of Labor and Industry Title 34: Flammable and Combustible Liquids; Preliminary Provisions
National Fire Protection Association NFPA 30: Flammable and Combustible Liquids Code
National Fire Protection Association NFPA 30A: Code for Motor Fuel Dispensing Facilities and Repair Garages
Environmental Protection Agency Detecting Leaks - Successful Methods Step-by-Step
Pennsylvania Department of Environmental Protection 25 PA Code Chapter 245: Administration of the Storage Tank and Spill Prevention Program
National Fire Protection Association NFPA 326: Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair
National Fire Protection Association NFPA 329: Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases
American Petroleum Institute API 1604: Closure of Underground Petroleum Storage Tanks
American Petroleum Institute API 2015: Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks
New England Interstate Water Pollution Control Commission Tank Closure Without Tears
Petroleum Equipment Institute PEI RP-1200: Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities

Petroleum Equipment Institute

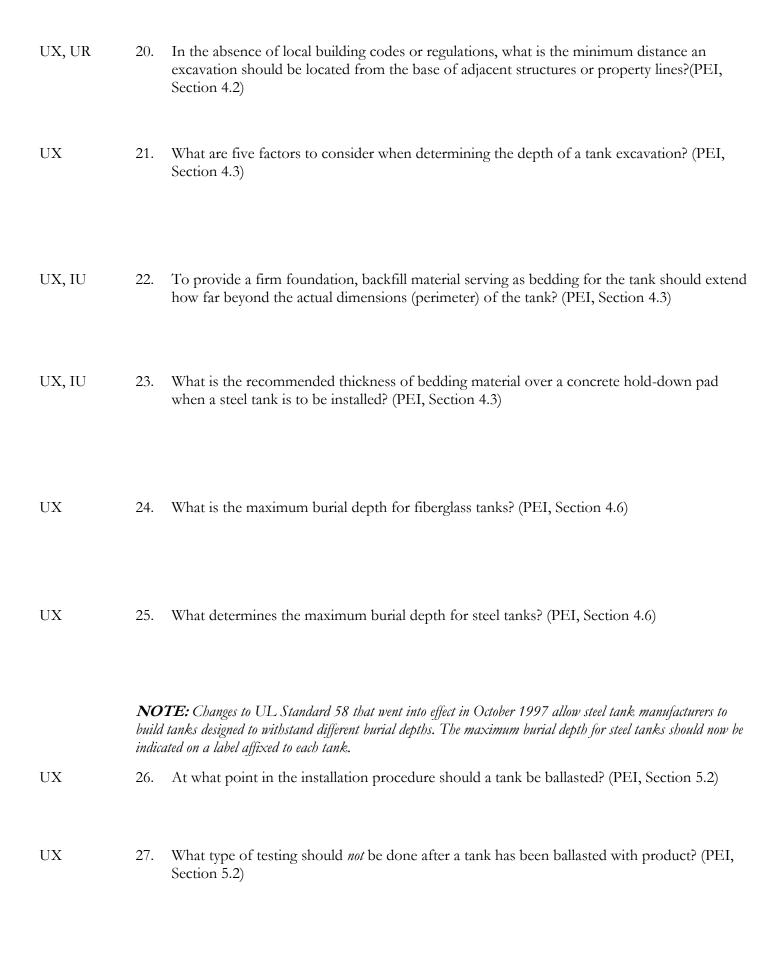
PEI RP-100: Recommended Practices for Installation of Underground Storage Systems

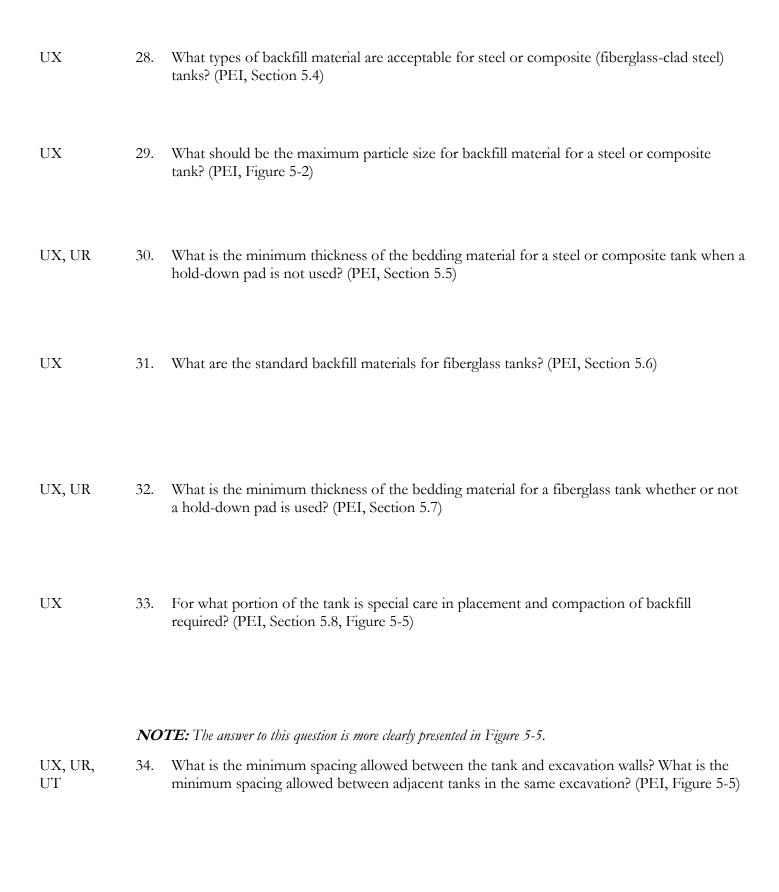
The following study guide questions are taken from the Petroleum Equipment Institute's "Recommended Practices for Installation of Underground Liquid Storage Systems" (PEI/RP100-2017).

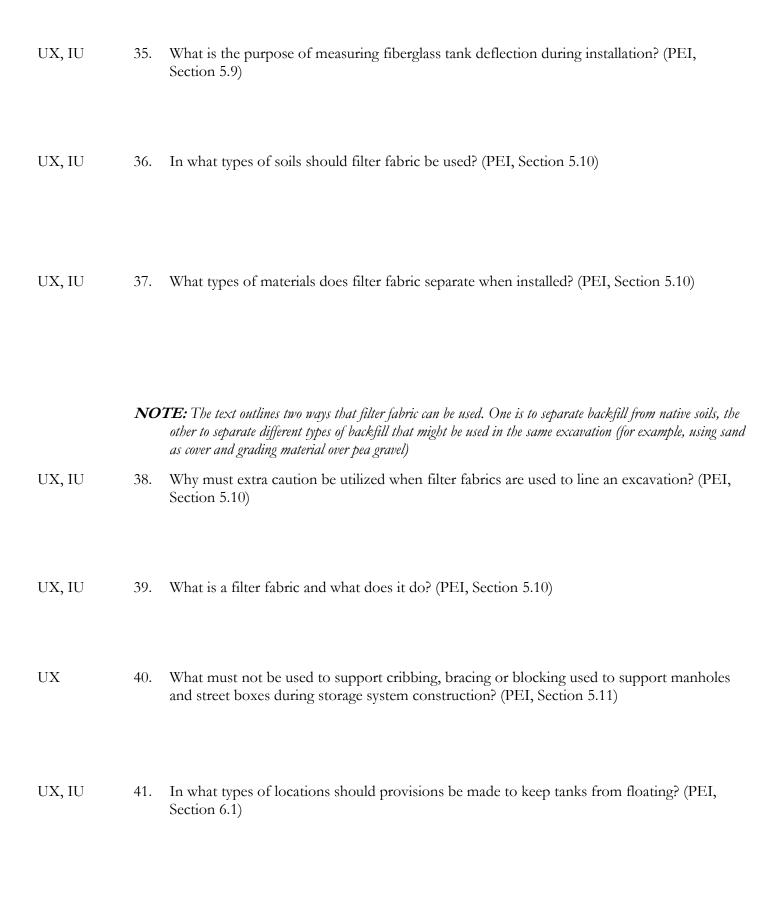
UX, IU	1.	What is the proper way to move a tank? (PEI, Section 2.2)
UX, UR, IU	2.	Cables or chains used to lift a tank should be at an angle from the vertical (included angle) or no more than degrees. (PEI, Section 2.2)
UX, IU	3.	When is it permissible to use chains or cables around the tank shell in order to move the tank? (PEI, Section 2.2)
UX, UT, IU	4.	At what point in the installation procedure should the air/soap test be performed? (PEI, Section 3.2)
UX, IU, UT	5.	What should be done with factory installed plugs before conducting the pre-installation air/soap test? (PEI, Section 3.2)
UX, UT, IU	6.	What is the maximum allowable internal pressure when performing the pre-installation test on eight foot diameter steel and fiberglass tanks? (PEI, Section 3.2)

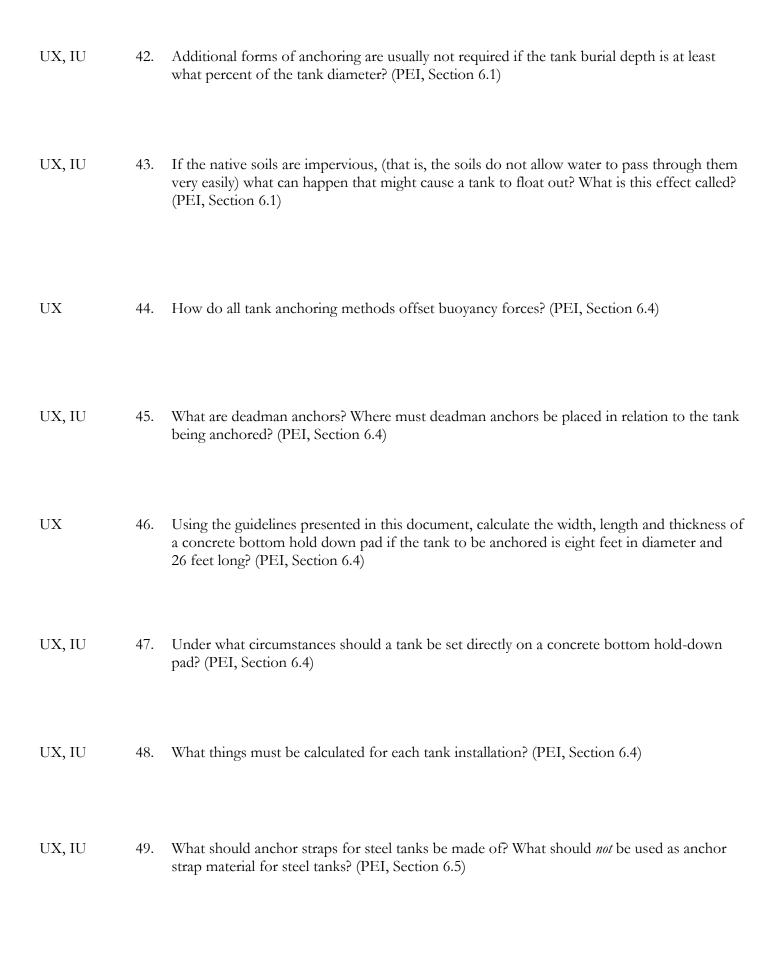


UX, IU	15.	What type of pre-installation test is acceptable for double-wall tanks with a liquid-filled interstice? (PEI, Section 3.6)
UX, IU	16.	What type of pre-installation test is acceptable for double-wall tanks shipped from the factory with a vacuum in the interstice? (PEI, Section 3.7)
UX, IU, UR, UT	17.	What utilities should be located before excavating begins? (PEI, Section 4.1)
	exco mus	OTE: The Pennsylvania Underground Utility Line Protection Act (Act 287 of 1996) requires notification by wators, designers or any person preparing to disturb the earth's surface anywhere in Pennsylvania. Contractors at call the One Call System (8-1-1) or (1-800-242-1776 outside PA) not less than three nor more than 10 king days in advance of beginning excavation or demolition work.
UX	18.	What are five factors to consider when determining the size, shape and depth of a tank excavation? (PEI, Section 4.1)
		a)
		b)
		c)
		d)
		e)
UX, UT	19.	Why do excavation cave-in situations require the use of additional backfill? (PEI, Section 4.1)

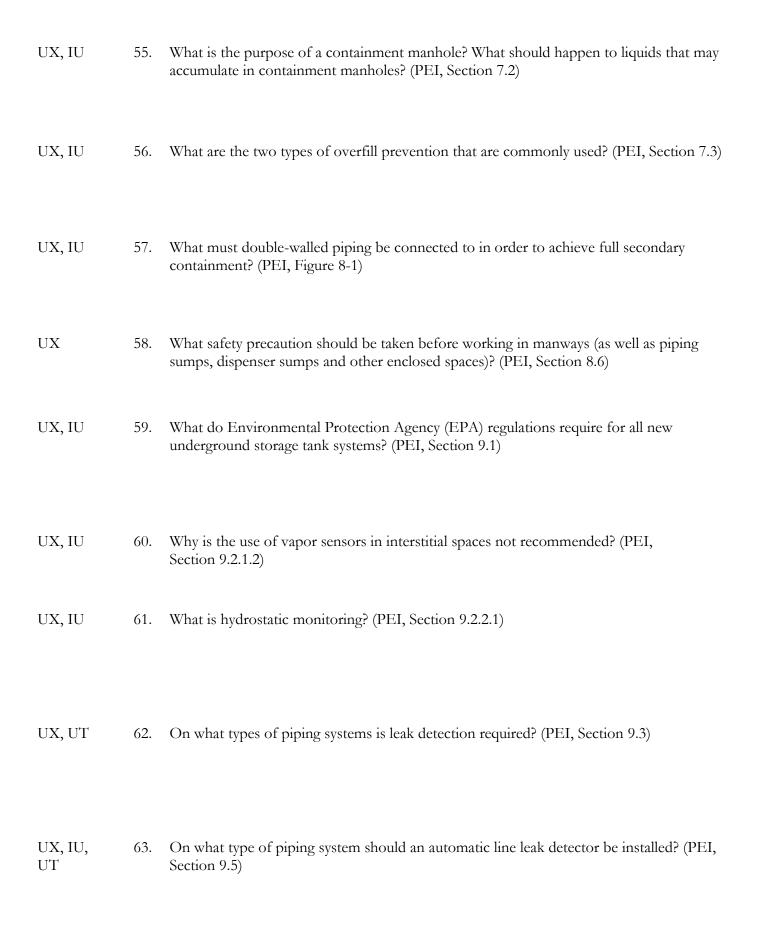




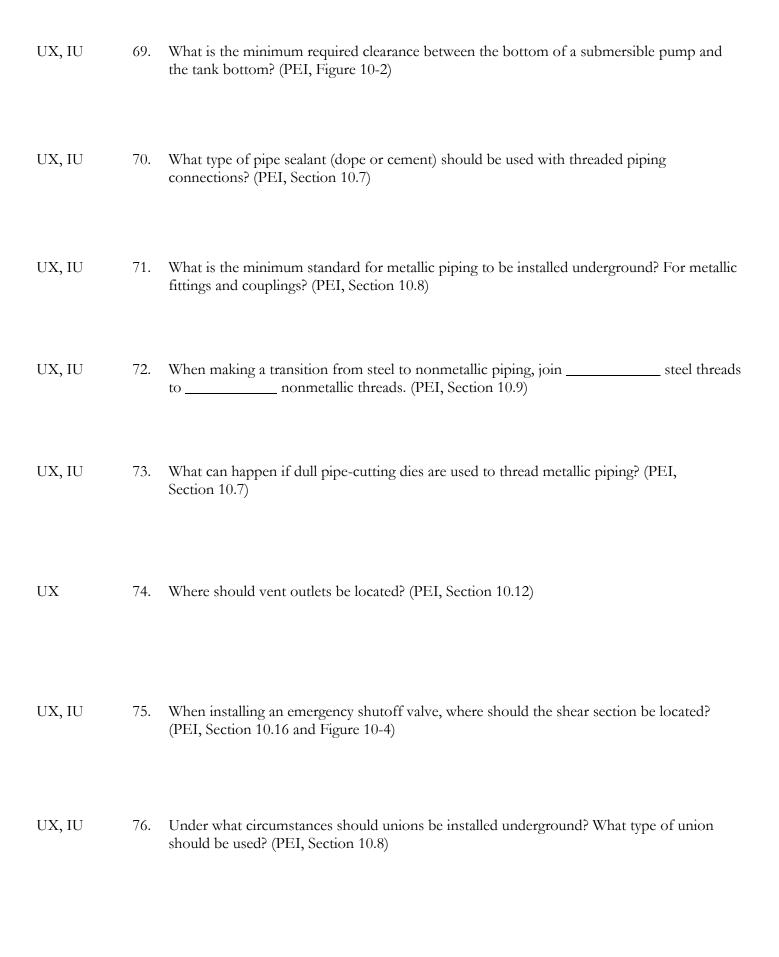


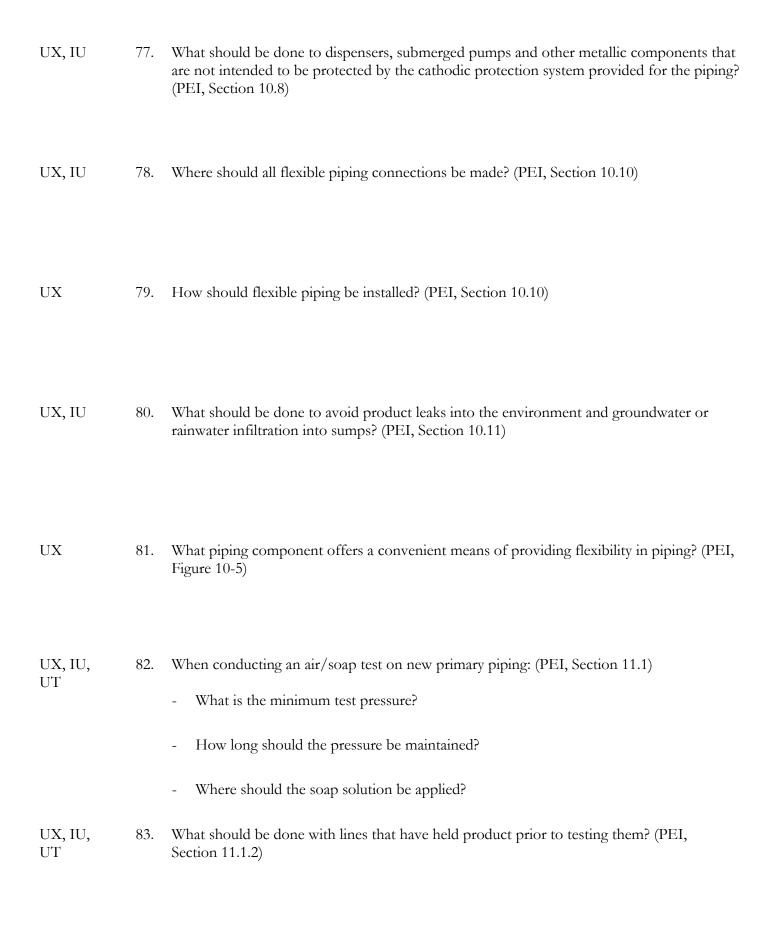


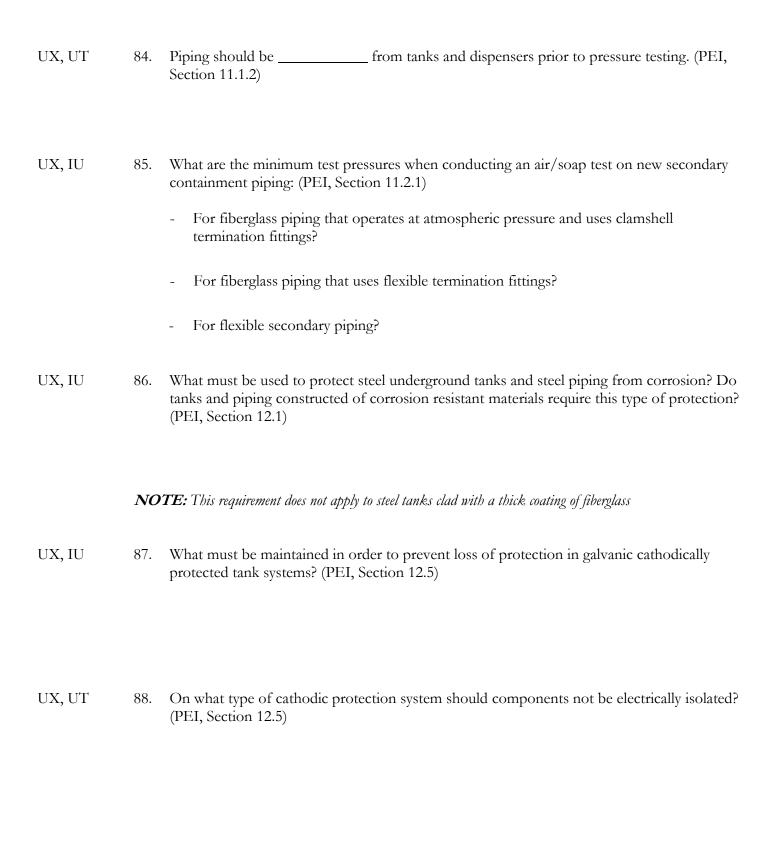
UX, IU	50.	What must be done to steel straps used to anchor steel and composite tanks to ensure the proper operation of the corrosion protection system? (PEI, Section 6.6)
UX, IU	51.	What are the required dimensions (thickness, width, length) of insulating materials used to separate anchor straps from steel and composite tanks? (PEI, Section 6.6)
UX, IU	52.	What materials are NOT acceptable for isolating anchor straps from steel and composite tanks? (PEI, Section 6.6)
UX	53.	What type of anchoring device should be secured through reinforcing in the deadmen? (PEI, Figure 6-4)
UX	54.	When installing and attaching tank anchor straps, what should be considered regarding: - Method of attachment? (PEI, Section 6.7) - Tightness? (PEI, Section 6.7) - Cleanliness? (PEI, Section 6.7) - Electrical isolation? (PEI, Section 6.7)
		- Corrosion protection? (PEI, Section 6.7)
	NO	TE: Coating with a dielectric material is a form of corrosion protection.

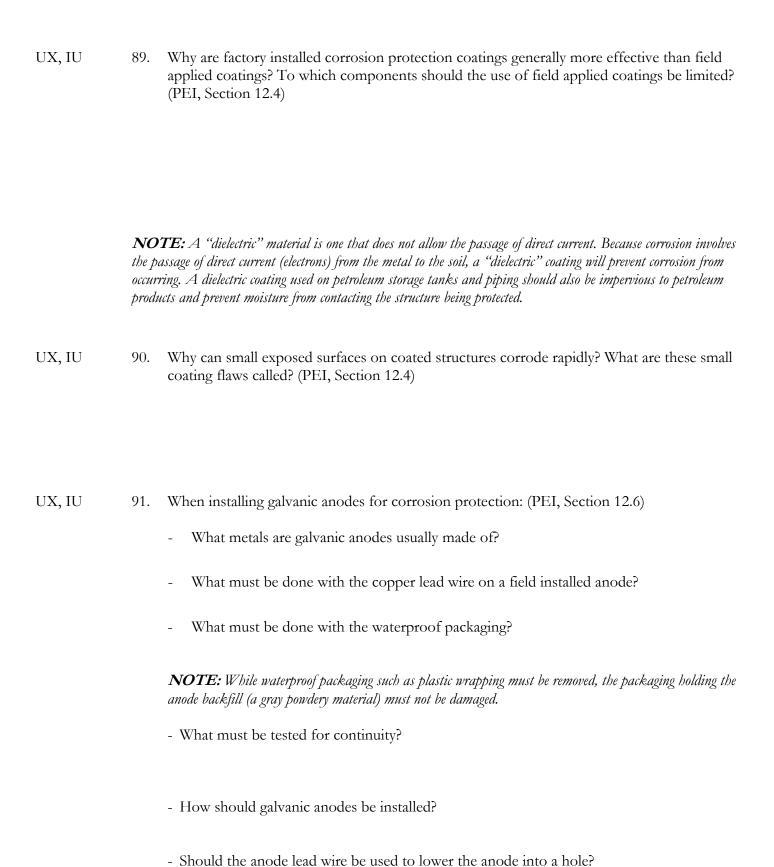


UX, IU	64.	What are five specific material requirements for storage system piping components? (PEI, Section 10.2)
		a)
		b)
		c)
		d)
		e)
UX, IU, UT	65.	What should be avoided when laying pipe? (PEI, Section 10.4)
UX, IU	66.	Why should pressurized piping be purged of air before it is tested or placed in service ? (PEI, Section 10.4)
UX, IU, UR	67.	Piping trench dimensions should allow for: - At least inches of bedding. (PEI, Section 10.4) - In traffic areas, at least inches of compacted backfill and paving between the top of the piping and grade. (PEI, Section 10.4) - A uniform slope of at least per foot. (PEI, Section 10.4) - The distance between piping runs should be times the pipe diameter. (PEI, Section 10.4)
IU	68.	Section 10.4) - At least inches clearance between the trench walls and the piping. (PEI, Section 10.4) What may aid in later pipe location? (PEI, Section 10.5)









UX, IU	92.	What information does the anode current output measurement provide? (PEI, Section 12.8)
UX, IU	93.	Buried wiring for underground storage tanks must be coated with (PEI, Section 12.9)
IU	94.	How do impressed current cathodic protection systems work? (PEI, Figure 12-2)
UX, IU	95.	In the absence of a specific plan, where should galvanic anodes be located in relation to the piping they are protecting? (PEI, Section 12.11)
UX, IU	96.	Why should two anodes be used to protect buried piping, even when one is probably enough to provide the required protection? (PEI, Section 12.11)
UX, IU	97.	When testing galvanic cathodic protection systems, what voltage relative to a copper-copper sulphate reference electrode is usually sufficient to provide corrosion protection? (PEI, Section 12.14 and Appendix B, Section B.5)

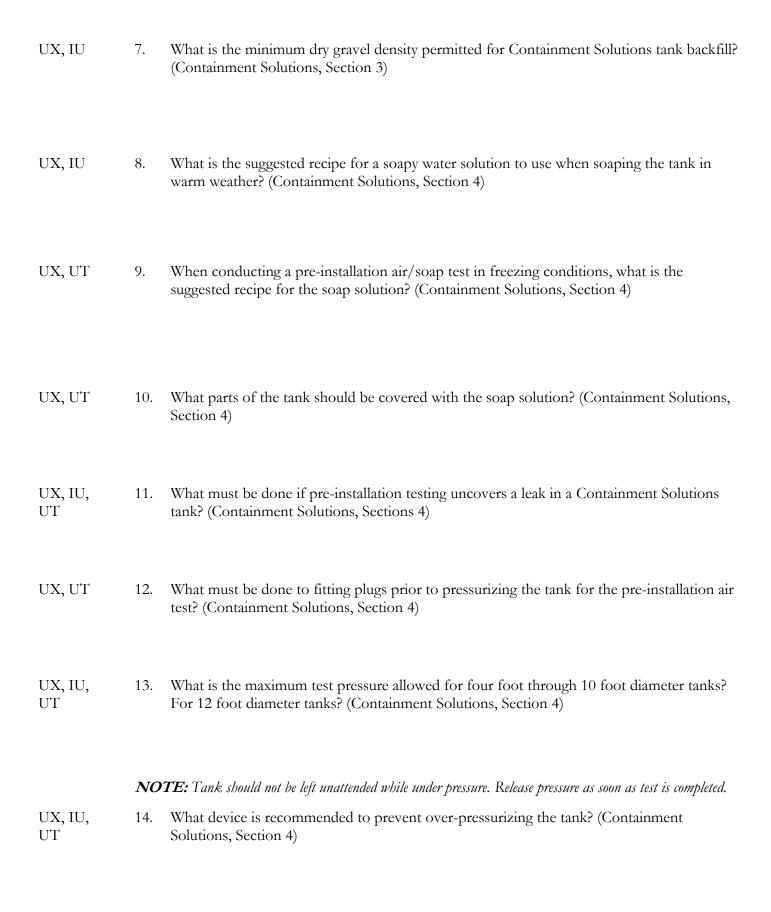
UX, IU	98.	What are five ways that electrical work can cause environmental problems? (PEI, Section 13.1)
		a)
		b)
		c)
		d)
UX, IU	99.	How much distance should separate electrical conduit and underground piping? (PEI, Section 13.2)
UX, IU	100.	Before placing a storage system in service, what testing should be performed: (PEI, Section 14)
		- To the cathodic protection system?
		- To a single-walled tank and piping?
		- To a double-walled tank and piping system?

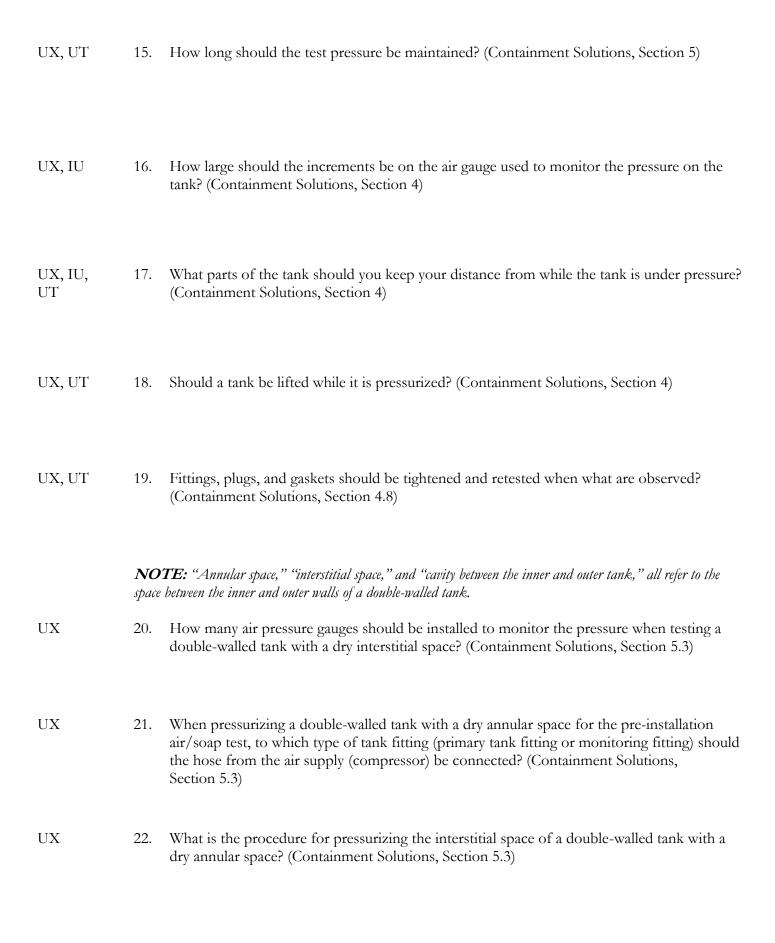
Containment Solutions

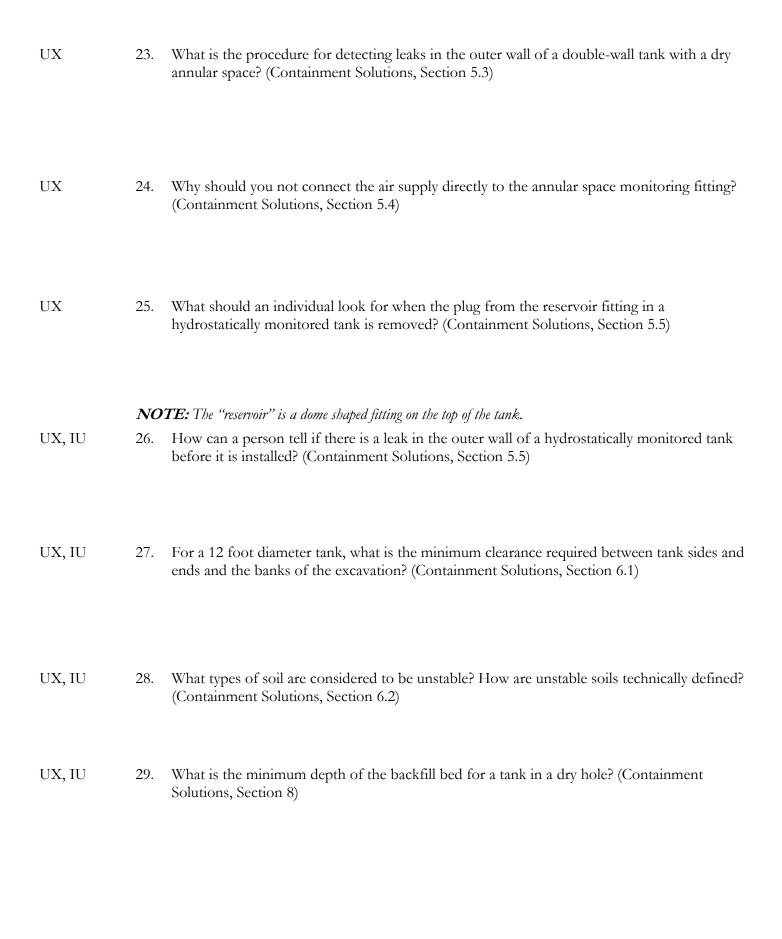
Fiberglass Storage Tank Installation Instructions & Operating Guidelines

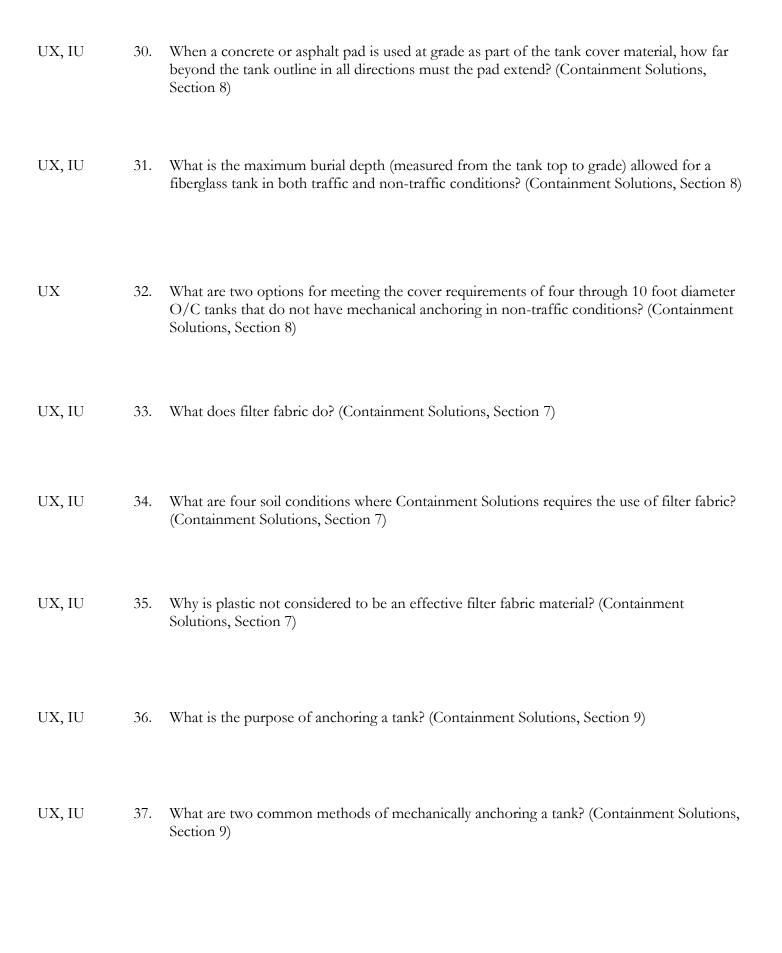
The following questions are based on Containment Solutions publication entitled "Fiberglass Storage Tank Installation Instructions & Operating Guidelines" (5/2015).

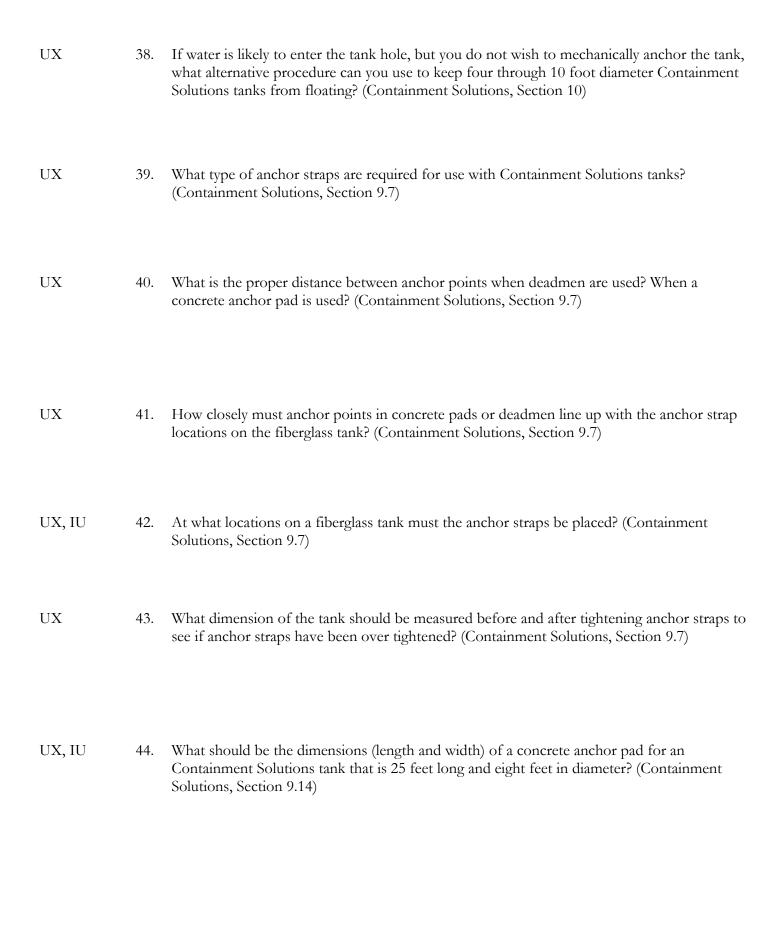
UX	1.	Can the truck driver delivering a Containment Solutions tank manually unload the tank by himself? (Containment Solutions, Section 2.1)
UX	2.	How many of the lifting lugs on a tank must be used when the tank is lifted? (Containment Solutions, Section 2.3)
UX	3.	Under what circumstances can a tank be rolled? (Containment Solutions, Section 2.1)
UX, IU	4.	What are the only materials that can be used to replace all the native soil that has been excavated? (Containment Solutions, Section 3)
UX	5.	Who should certify that backfill meets all required specifications? (Containment Solutions, Section 3)
UX, IU	6.	What is the range of particle sizes allowed when gravel is used for a backfill material? When crushed stone is used? (Containment Solutions, Section 3)

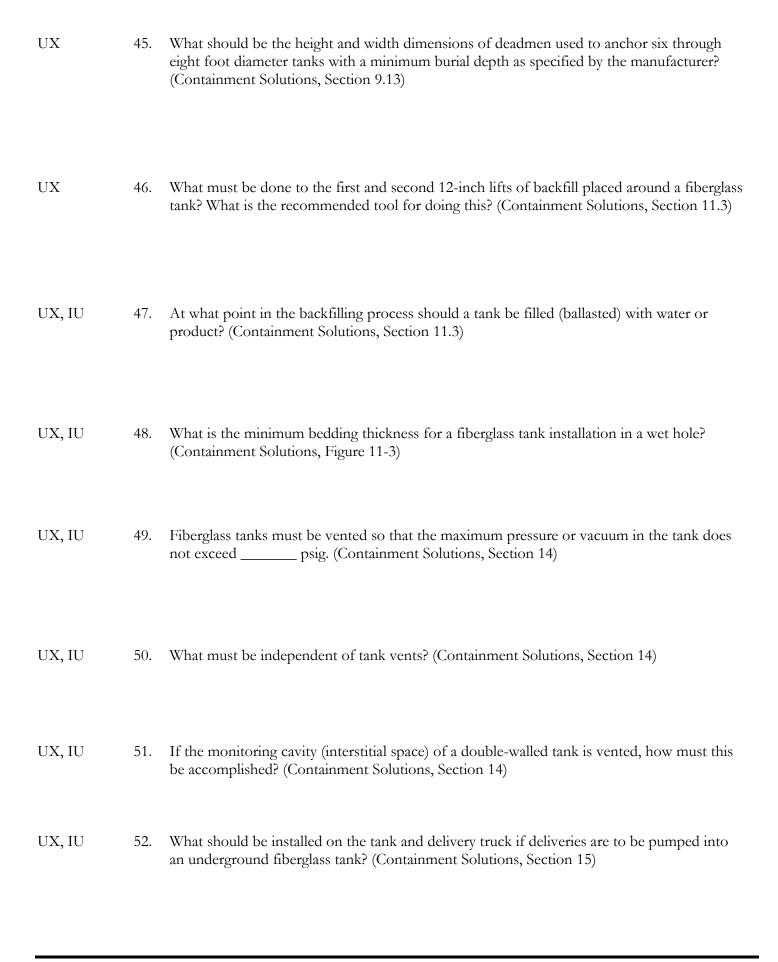












UX, IU	53.	What will happen to a fiberglass tank if it is overfilled during a pressurized delivery? (Containment Solutions, Section 15)
UX, IU	54.	Is it necessary to vent the interstitial space (monitoring cavity) of a fiberglass tank with a hydrostatic (liquid filled interstitial space) monitoring system? (Containment Solutions, Section 17)
UX, IU	55.	How can the joint between the containment collar and the sump be tested to see if it is liquid tight? (Containment Solutions, Section 18)

American Petroleum Institute

API 1615: Installation of Underground Petroleum Storage Systems

The following study guide questions are taken from the American Petroleum Institute's Recommended Practice 1615, "Installation of Underground Petroleum Storage Systems" (Sixth Edition, April, 2011).

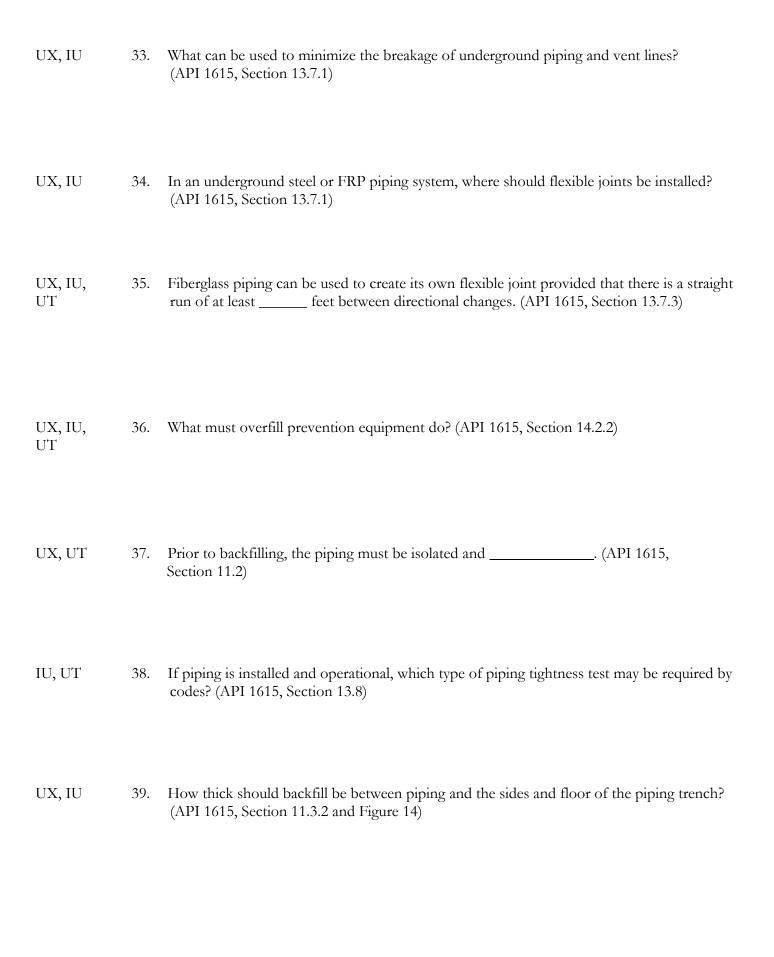
UX, IU	1.	What is an extractor fitting? (API 1615, Section 2.29)
UX, IU	2.	What is an interstice? (API 1615, Section 2.42)
UX, IU, UT	3.	What are some of the functions of a sump? (API 1615, Section 2.87)
UX, IU	4.	What things should be included in a preconstruction site-specific plan? (API 1615, Section 6.1.1)
UX, IU	5.	Why is it important to install a property designed corrosion protection system when installing new steel tanks next to an existing steel UST system? (API 1615, Section 7.2.2)

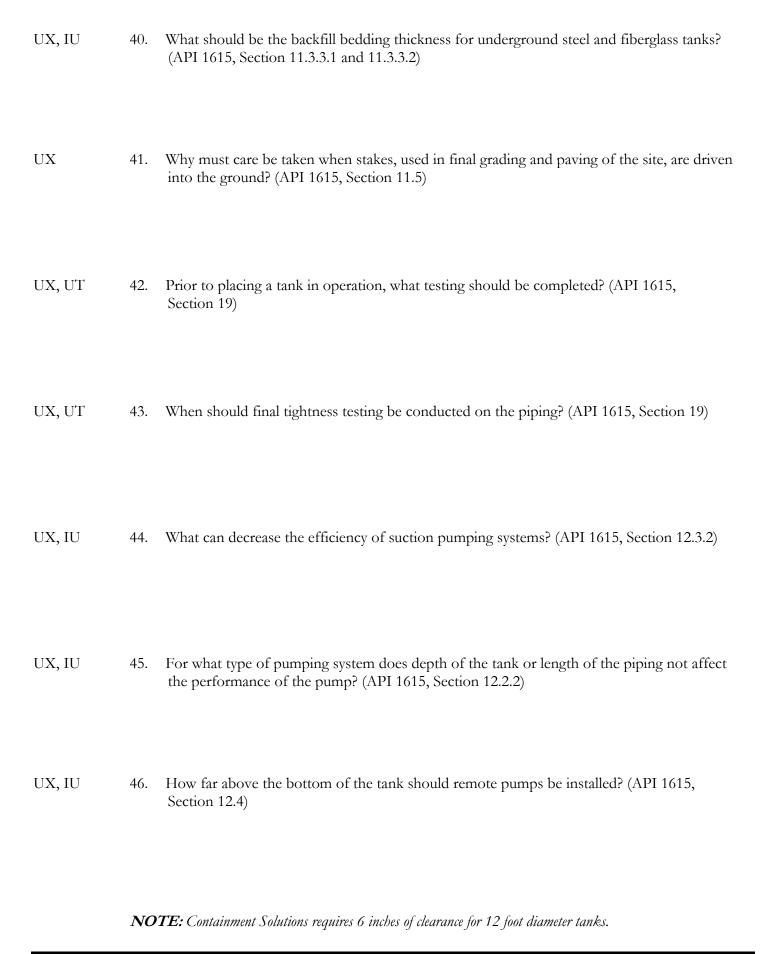
UX, IU	6.	Tanks should be located at least how many feet from the property line of any adjacent property on which a structure can be built? (API 1615, Section 8.3.2)
UX	7.	Where should underground tanks being stored temporarily at a construction site be located? (API 1615, Section 9.1.4)
UX, IU	8.	What type of chock should be used to prevent a tank from moving during storage? (API 1615, Section 9.1.5)
IU	9.	If significant damage has occurred to a tank when it arrives at the installation site, what should be done? (API 1615, Section 9.2.2)
UX, IU	10.	What measurement should be taken prior to installation of an underground tank? (API 1615, Section 9.2.4)
UX	11.	Prior to pressurization in a preinstallation tank test the tank should be (API 1615, Section 9.5(b))
UX, IU, UT	12.	What does the term "interstitial space" or "annular space" refer to? (API 1615, Section 9.6.1)

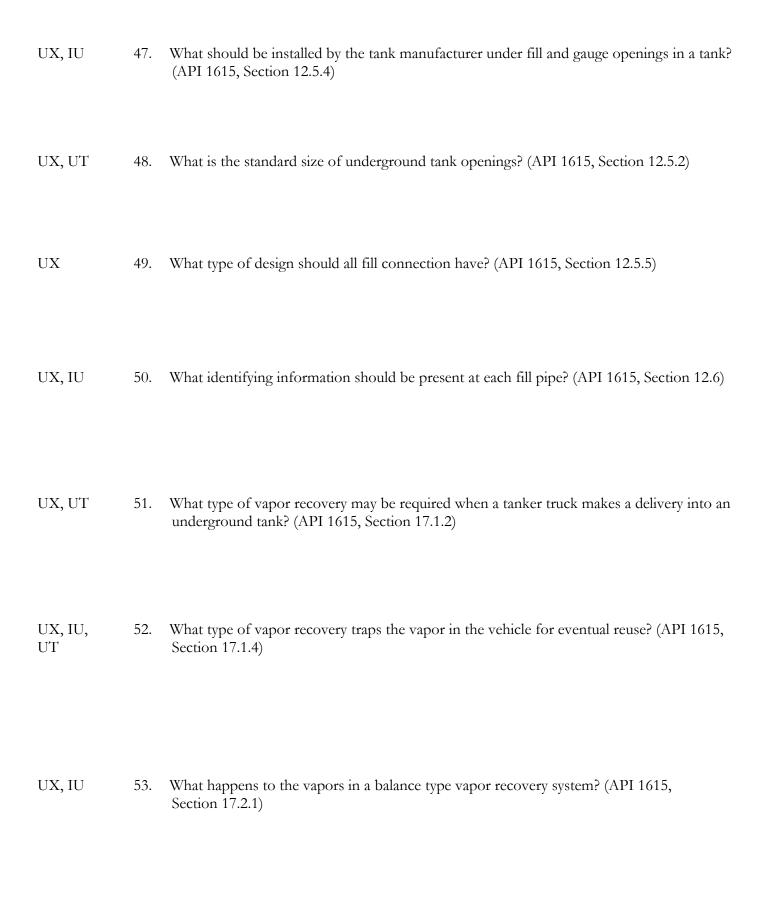
UX	13.	When should piping be isolated and tested? (API 1615, Section 9.7.1)
UX, UR, IU, UT	14.	What are the API recommendations for depth of cover over tanks that are located in traffic areas? (API 1615, Section 11.4)
UX, IU	15.	What conditions can cause a tank to float? (API 1615, Section 10.2.1)
UX	16.	If can be expected, tanks should be anchored. (API 1615, Section 10.3.1)
UX, UR	17.	How should anchor straps used with concrete anchor pads or deadmen be installed? (API 1615, Section 10.3.3)
UX	18.	How should tanks of different diameters be aligned? (API 1615, Figure 11)
UX, IU	19.	Who can provide professional assistance in determining anchoring requirements? (API 1615, Section 10.3.1)

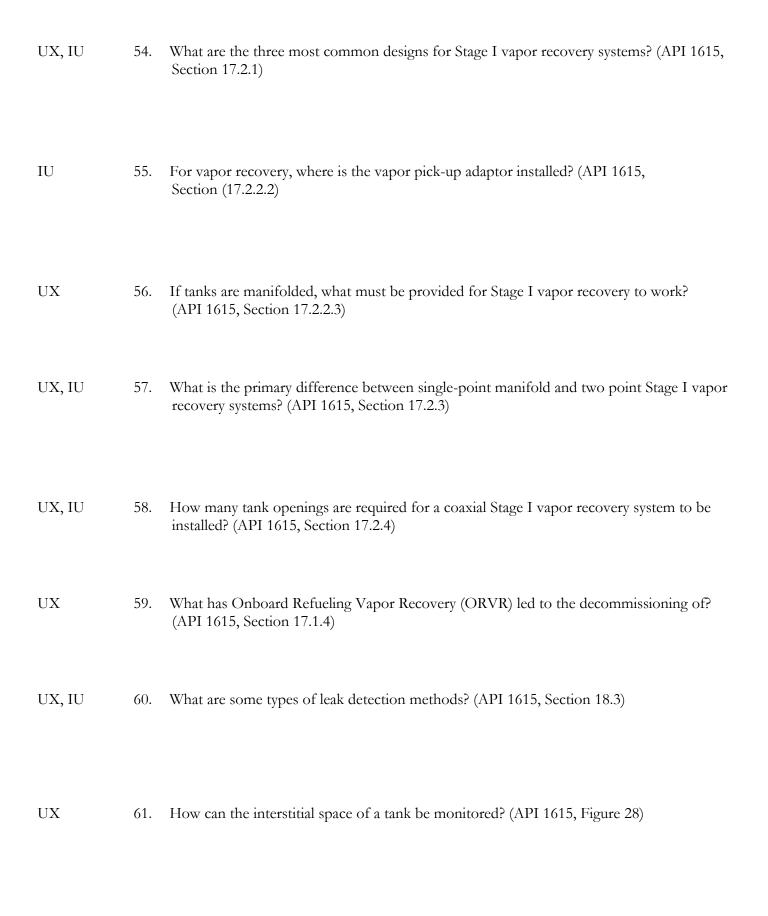
UX	20.	What should occur prior to installation of submersible pumps? (API 1615, Section 10.4.3)
UX, IU	21.	What are the Environmental Protection Agency's corrosion protection requirements for new tanks and product piping? (API 1615, Section 15.1)
IU	22.	What types of tanks can be used to meet the regulatory requirements for corrosion protection? (API 1615, Section 15.1)
IU	23.	How does a sacrificial anode system protect steel equipment from corrosion? (API 1615, Section 15.2)
IU	24.	What is the important isolation area when a sacrificial anode system is used on piping? (API 1615, Section 15.2.3)
UX, IU	25.	How should metallic anchor straps be isolated from a steel tank? (API 1615, Section 10.3.5)

UX, IU	26.	How should underground piping be sloped? (API 1615, Section 13.2.2)
UX, UT	27.	What should be avoided in order to decrease problems when tightness testing? (API 1615, Section 13.2.4)
UX, IU	28.	What material should be used to assemble the aboveground portion of vent piping? What materials should <u>not</u> be used? (API 1615, Section 13.3.3)
UX, IU	29.	What should be the minimum height of vent outlets above the adjacent ground surface? In what direction should vapors be discharged? (API 1615, Section 13.3.3)
UX, IU	30.	What should be the minimum rating of tees, elbows, and unions used in underground steel piping? What type of iron should these fittings be made of? (API 1615, Section 13.5)
UX, IU	31.	Any FRP pipe used in an underground petroleum installation should be (API 1615, Section 13.4.1)
	NO:	TE: See section 2.50 for the specific meaning of "listed."
UX, IU	32.	Fiberglass pipe and fittings connections should conform to the following: (API 1615, Section 13.4)
		a)
		b)
		c)









American Petroleum Institute

API 1632: Cathodic Protection of Underground Storage Systems

The following study guide questions are taken from the American Petroleum Institute's Recommended Practice 1632, "Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems" (Third Edition, May 1996, Reaffirmed 2002).

UX	1.	What are the four components of an electrochemical corrosion cell? (API 1632, Section 2.1)
UX	2.	What happens at the anode of the corrosion cell? (API 1632, Section 2.1)
UX	3.	What does not happen at the cathode of a corrosion cell? (API 1632, Section 2.1)
UX	4.	What happens along the metallic path connecting the anode and cathode? (API 1632, Section 2.1)
UX	5.	What is the electrolyte in the case of buried structures such as underground tanks and piping? (API 1632, Section 2.1)
UX	6.	Which component of a corrosion cell is generally created in an area of relatively low oxygen concentration? In an area of relatively high oxygen concentration? How does this affect buried tanks? (API 1632, Section 2.2.1.3)
UX	7.	What are four soil characteristics that can influence the rate of corrosion on buried steel structures? (API 1632, Section 2.2.1.4)

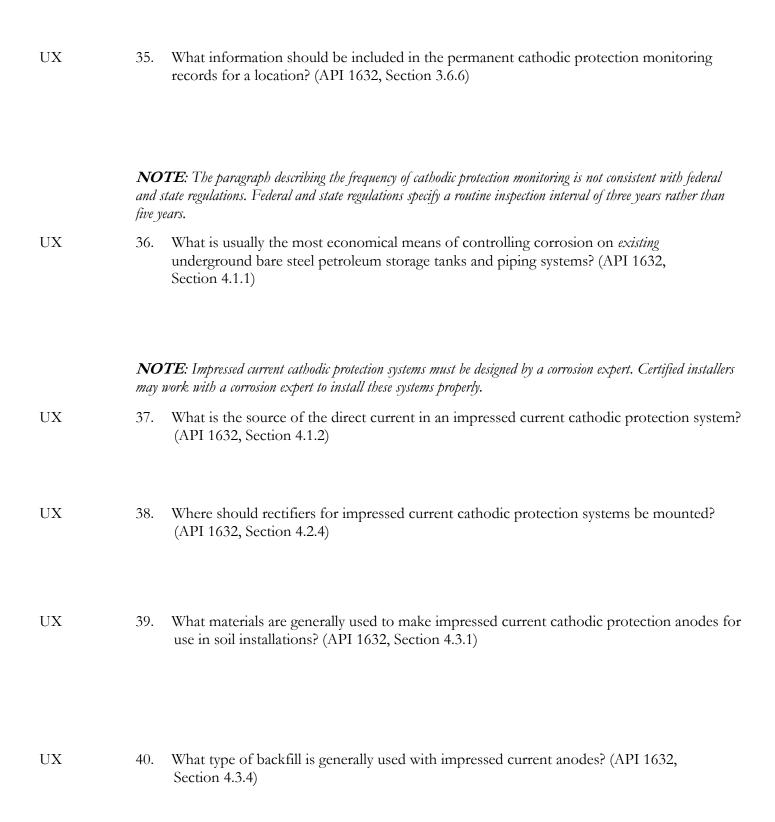
UX	8.	What are the most damaging stray currents? Where do they typically come from? (API 1632, Section 2.2.2.2)
UX	9.	Under what conditions does bimetallic corrosion occur? (API 1632, Section 2.2.2.3)
UX	10.	In a bimetallic corrosion cell, where does the most severe corrosion attack occur? (API 1632, Section 2.2.2.3)
UX	11.	How does cathodic protection work? (API 1632, Section 2.3.1)
UX	12.	What are two methods of applying cathodic protection to underground metal structures? (API 1632, Section 2.3.1)
UX	13.	In a galvanic cathodic protection system, all the elements of a corrosion cell are intentionally created. What type of metal is used for the anode (the place where corrosion occurs)? (API 1632, Section 2.3.2.1)
UX	14.	As a corrosion cell develops on an underground storage tank where a galvanic cathodic protection system has been established, what happens at the anode? What happens at the cathode? (API 1632, Section 2.3.2.1)

UX	15.	What are seven advantages of galvanic cathodic protection systems? (API 1632, Section 2.3.2.2)
		a)
		b)
		c)
		d)
		e)
		f)
		g)
UX	16.	What metal has the most negative potential (greatest negative voltage) when measured relative to a copper/copper sulfate reference electrode? (API 1632, Table 1)
UX	17.	What are four disadvantages of galvanic cathodic protection systems? (API 1632, Section 2.3.2.3)
		a)
		b)
		c)
		d)
UX	18.	What materials are used to manufacture anodes in an impressed current cathodic protection system? (API 1632, Section 2.3.3.1)

UX	19.	What are five advantages of impressed current cathodic protection systems? (API 1632, Section 2.3.3.2)
		a)
		b)
		c)
		d)
		e)
UX	20.	What are five disadvantages of impressed current cathodic protection systems? (API 1632, Section 2.3.3.3)
		a)
		b)
		c)
		d)
		e)
UX	21.	Which type of cathodic protection system is normally required for existing underground tank installations? (API 1632, Section 2.3.4.1)
UX	22.	A plot plan of a cathodically protected facility should identify which components of the cathodic protection system? (API 1632, Section 2.3.5)

UX	23.	What are sacrificial anodes usually made of? (API 1632, Section 3.1.1)
UX	24.	In what type of soils are zinc anodes best utilized? (API 1632, Section 3.1.1)
UX	25.	In what types of soils are magnesium anodes frequently used? (API 1632, Section 3.1.1)
UX	26.	Because of low driving voltage and low current output, what type of structure is sacrificial anode cathodic protection usually limited to? (API 1632, Section 3.1.2)
UX	27.	Will a cathodic protection system protect metal piping attached to the tank - but isolated from the tank by nonconductive bushings - when the tank has factory installed galvanic anodes? (API 1632, Section 3.2.1)
UX	28.	Magnesium and zinc anodes are usually supplied in a prepackaged chemical backfill. What are three functions of this chemical backfill? (API 1632, Section 3.4.2)

UX	29.	What are two reasons why galvanic anodes should be installed near the bottom of the structure they are protecting? (API 1632, Section 3.4.3)
		a)
		b)
UX	30.	Why must a structure that is galvanically cathodically protected be electrically isolated from other buried metal, including piping and electrical conduit? (API 1632, Section 3.5.2)
UX	31.	What measurement is the most common criterion for ensuring adequate sacrificial anode protection for buried tanks and piping? (API 1632, Section 3.6.1)
UX	32.	Where should soil access manholes used for making structure-to-soil potential measurements be located? (API 1632, Section 3.6.2)
UX	33.	Where should long-life reference cells used for cathodic protection monitoring be located? (API 1632, Section 3.6.3)
UX	34.	What type of voltmeter is required for making a structure-to-soil potential measurement? To what are the two leads from the voltmeter connected? (API 1632, Section 3.6.5)



UX	41.	Which lead of the rectifier (positive or negative) in an impressed current cathodic protection system must be attached to the structure(s) to be protected from corrosion? What will happen if the leads are reversed? (API 1632, Section 4.3.4)
UX	42.	Why must special care be taken in insulating all buried wires attached to the positive terminal of the rectifier in an impressed current cathodic protection system? (API 1632, Section 4.3.6)

NACE International

NACE SP0285: Corrosion Control of Underground Storage Tank Systems by Cathodic Protection

The following study guide questions are taken from the NACE International publication number SP0285-2011 "Corrosion Control of Underground Storage Tank Systems by Cathodic Protection." (March 2011)

IU	1.	What is the definition of cathodic protection? (NACE SP0285-2011, Section 2)
IU	2.	What is the function of coatings in corrosion control systems? (NACE SP0285-2011, Section 3.4.2)
IU	3.	When making voltage measurements on cathodically protected systems, where should the reference electrode be located? (NACE SP0285-2011, Section 5.1.4)
IU	4.	What are three criteria that can be used to demonstrate that adequate cathodic protection has been achieved? (NACE SP0285-2011, Section 5.2.1) 5.2.1.1
		5.2.1.2
		5.2.1.3
IU	5.	How often should sources of impressed current be checked for proper operation? (NACE SP0285-2011, Section 8.2.3.1)

IU	6.	How often should impressed current protective facilities be inspected as part of a preventive maintenance program? (NACE SP0285-2011, Section 8.2.3.2)
IU	7.	How often should cathodic protection test equipment be checked for accuracy? (NACE
	,,	SP0285-2011, Section 8.2.4)
		NACE – Corrosion Control of UST Systems Questions

Pennsylvania Department of Labor and Industry

Title 34: Flammable and Combustible Liquids; Preliminary Provisions

The following study guide questions are taken from Pennsylvania Department of Labor and Industry's "Flammable and Combustible Liquids; Preliminary Provisions", Title 34, Chapter 14 of the Pennsylvania Code. Also, Philadelphia and Pittsburgh have their own flammable and combustible liquid codes which should be consulted before doing work in these cities.

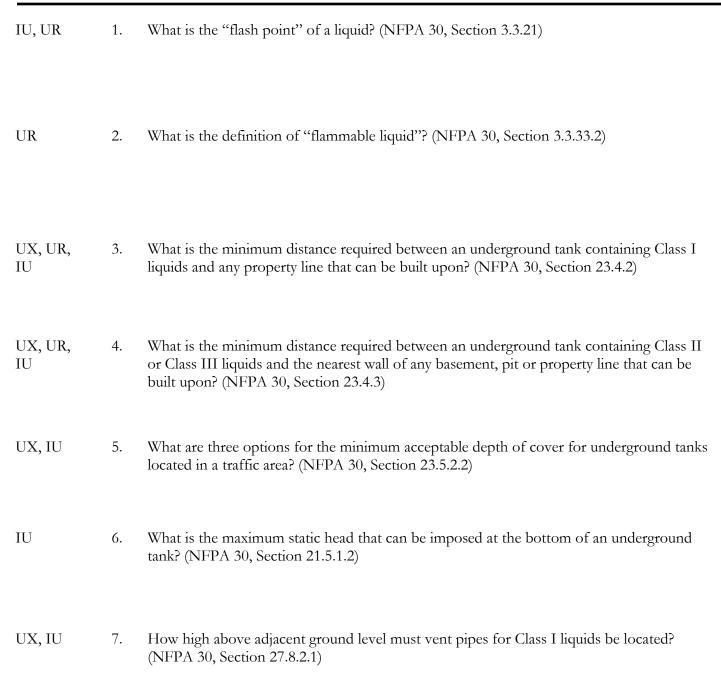
UX, IU	1.	What is the definition of a Class I flammable liquid? (Flammable & Combustible Liquids, Section 14.6)
UX, IU		What is the distance required between an underground tank storing a Class I liquid and the nearest wall of any basement, pit or cellar or adjoining property line? (Flammable & Combustible Liquids, Section 14a.21)
UX, IU	3.	How far apart must underground tanks be set? (Flammable & Combustible Liquids, Section 14a.22)
	NOT	E: This requirement is also generally interpreted to mean that the same amount of clearance should be
		allowed between a tank and the excavation wall, as well as over the tank.
UX, IU	4.	Tanks not subject to traffic loading may be covered with not less than of backfill topped with a slab of reinforced concrete not less than thick. (Flammable & Combustible Liquids, Section 14a.22)

UX, IU	5.	What are the minimum requirements for underground tank cover in traffic areas? (Flammable & Combustible Liquids, Section 14a.22)
UX, IU	6.	How far beyond the outline of a tank must concrete or asphalt paving used as part of the cover of an underground tank extend? (Flammable & Combustible Liquids, Section 14a.22)
UX, IU	7.	What are two requirements for underground tank fill lines? (Flammable and Combustible Liquids, Section 14a.24a)
UX, IU	8.	What are three requirements for filling and vapor recovery connections? (Flammable and Combustible Liquids, Section 14a.24a)
UX, IU	9.	The design and location of vent pipe systems shall take into consideration (Flammable and Combustible Liquids, Section 14a.25)
UX	10.	Before being covered or placed in use, tanks and piping shall (Flammable and Combustible Liquids, Section 14a.26)

11.	What three procedures are required when an underground tank is taken out of service for a period of three months or less? (Flammable and Combustible Liquids, Section 14a.221) a.)
12.	b.) c.) If a tank is to be disposed of as junk, it shall be (Flammable and Combustible Liquids, Section 14a.222)
13.	If a tank is to be closed in place, it must be filled with (Flammable and
	Combustible Liquids, Section 14a.222)
	12.

NFPA 30: Flammable and Combustible Liquids Code

The following study guide questions are taken from National Fire Protection Association (NFPA) Code 30, "Flammable and Combustible Liquids Code," 2018 edition.



UX, IU	8.	What is the minimum inside nominal diameter for a vent pipe for an underground tank? (NFPA 30, Section 23.6.2)
UX, IU	9.	What are the three factors that determine venting capacity for an underground tank? (NFPA 30, Section 23.6)
UX, IU	10.	Openings for manual gauging on tanks shall be provided with (NFPA 30, Section 21.8.7)
UX, UR, IU,	11.	What is the only acceptable type of joint when piping systems handling Class I liquids are located in concealed spaces within buildings? (NFPA 30, Section 27.5.1.4)
UR, IU	12.	What type of material should be used to fill an underground tank that is abandoned in place? (NFPA 30, Appendix C.4.11)
UR, IU	13.	After removal and cleaning, how should an underground tank be disposed? (NFPA 30, Appendix C.6.3, C.6.4)

NFPA 30A: Code for Motor Fuel Dispensing Facilities and Repair Garages

The following study guide questions are taken from National Fire Protection Association (NFPA) Code 30A, "Code for Motor Fuel Dispensing and Repair Garages," 2018 edition.

IU	1.	What is the definition of a combustible liquid? What is the definition of a Class IIIA combustible liquid? (NFPA 30A, Section 3.3.9.1 and 3.4.2.2)
UX, IU	2.	What is the maximum length of hose allowed at an automotive service station for dispensing fuel into vehicles? (NFPA 30A, Section 6.5.1)
UX, IU	3.	What type of device is required on all hoses dispensing Class I liquids to prevent spillage should a vehicle drive away with the dispensing nozzle still in the vehicle fuel tank? (NFPA 30A, Section 6.5.2)
UX, IU	4.	What device must be installed at the base of each individual island-type dispenser connected to a remote pumping system? (NFPA 30A, Section 6.3.9) - How must this device be anchored? - Can a device incorporating a slip-joint feature be used? - How often must the operation of this device be checked? (6.3.9.1)

 UX, IU 6. A power shut-off switch is required to cut power to all dispensing devices in the event of an emergency (section 6.7). Where should this switch be located at attended self-service stations? (NFPA 30A, Section 6.7.1) - Where should it be located at unattended self-service stations? (NFPA 30A, Section 6.7.2) 	

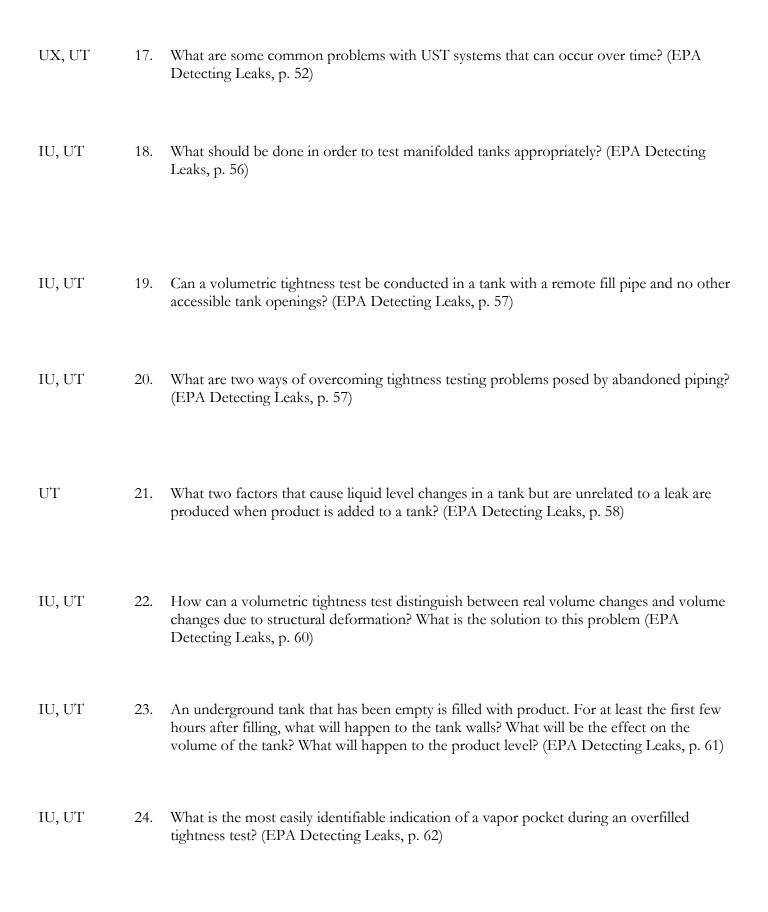
Environmental Protection Agency

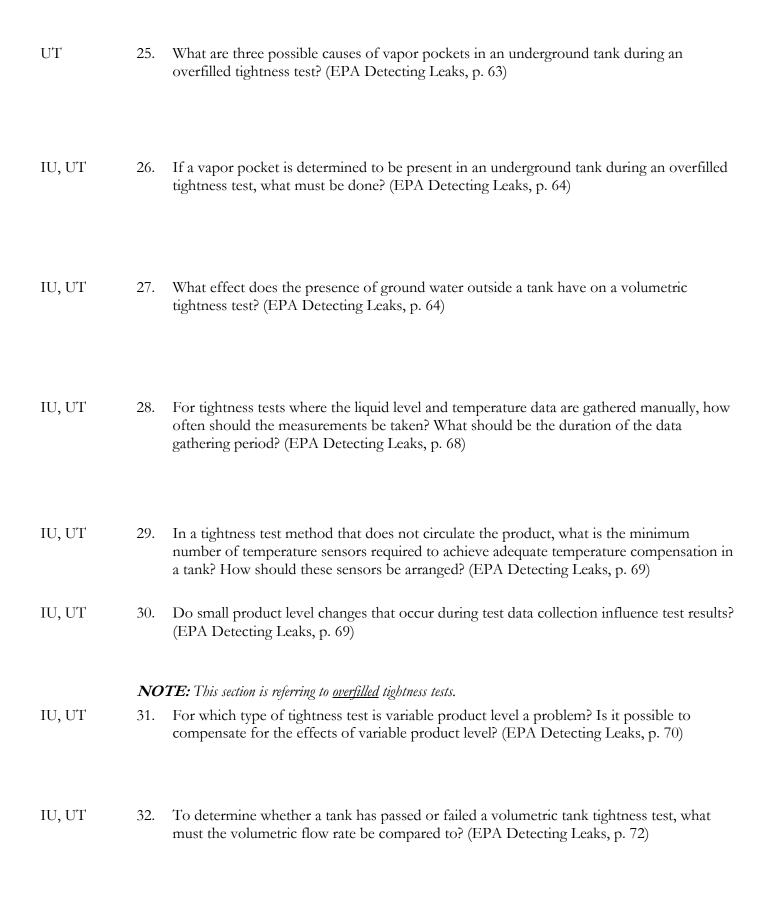
Detecting Leaks - Successful Methods Step-by-Step

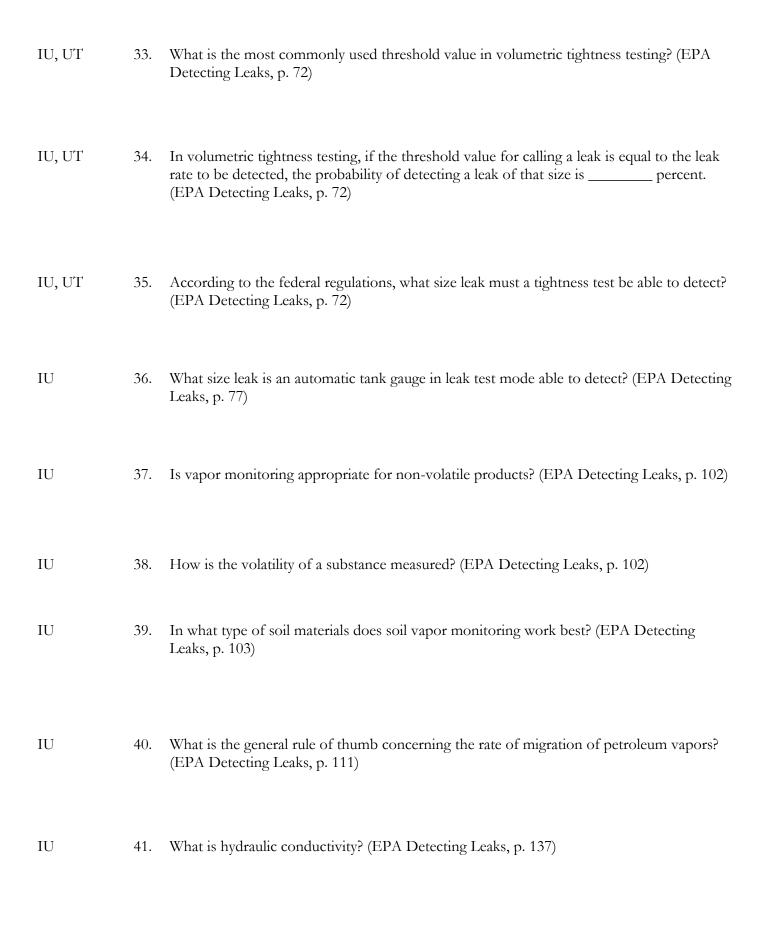
The following study questions were taken from the US Environmental Protection Agency's (EPA) Publication Number EPA/530/UST-89/012, "Detecting Leaks - Successful Methods Step-by-Step" (November 1989).

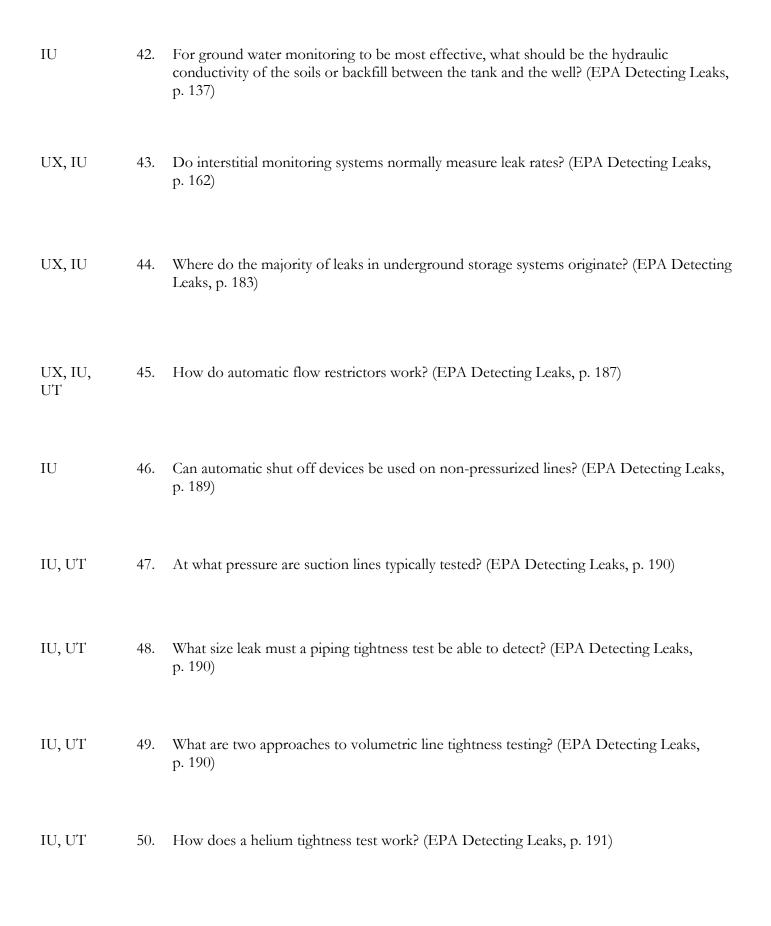
UX, IU	1.	What are seven methods of tank leak detection allowed by federal regulations? (EPA Detecting Leaks, p. 2)
UX	2.	Ground water monitoring cannot be used at sites where the ground water depth is more than feet. (EPA Detecting Leaks, p. 8)
UX, IU, UT	3.	How can water be detected in underground storage tanks? (EPA Detecting Leaks, p. 17)
UT	4.	What two factors influence the effects of evaporation on a tank system? (EPA Detecting Leaks, p. 20)
IU	5.	What is the cumulative overage or shortage allowed by the rules for monthly inventory reconciliation? (EPA Detecting Leaks, p. 29)
IU	6.	For what range of tank sizes does manual tank gauging have the same leak detection sensitivity as inventory control? (EPA Detecting Leaks, p. 33)
	For ta	TE: Manual tank gauging may not be used for leak detection for tanks more than 2,000 gallons capacity. Inks between 1,001 and 2,000 gallons, manual tank gauging must be used with tightness testing. Refer to PA booklet entitled "Manual Tank Gauging for Small Underground Storage Tanks" 1510-B-93-005) for more information on this method of leak detection.
IU, UT	7.	How do volumetric tightness test methods determine if there is a leak? (EPA Detecting Leaks, p. 48)

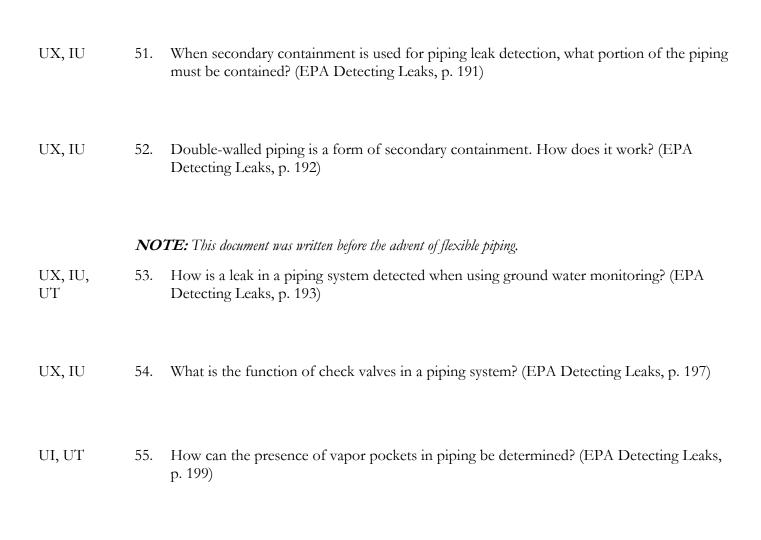
IU, UT	8.	Into what two categories can volumetric tests be divided? (EPA Detecting Leaks, p. 50)
UT	9.	In tank tightness testing, the end of the analysis is a calculated (EPA Detecting Leaks, p. 50)
	NO.	TE: "Partially filled" tests are also commonly known as "underfilled" tests.
UT	10.	Why must sensing devices be considerably more sensitive for partially-filled tank tests than for overfilled tank tests in order to achieve the same accuracy? (EPA Detecting Leaks, p. 50)
UT	11.	Is the tank considered to be leaking if the temperature – compensated volume change exceeds the detection criterion? (EPA Detecting Leaks, p. 50)
IU, UT	12.	What should be done if a tank to be tightness tested contains a drop tube? (EPA Detecting Leaks, p. 53 & 57)
UX, UT	13.	What should be done when trying to tightness test a tank and abandoned piping is found? (EPA Detecting Leaks, p. 53)
IU, UT	14.	How can the correct coefficient of expansion for a product be determined? (EPA Detecting Leaks, p. 54 & 67)
UT	15.	What values and information should the tester determine during the waiting period(s) of the test? (EPA Detecting Leaks, p. 50)
IU, UT	16.	How can the height-to-volume conversion factor for a tightness test be determined? (EPA Detecting Leaks, p. 54 & 67)











Pennsylvania Department of Environmental Protection

25 PA Code Chapter 245: Administration of the Storage Tank and Spill Prevention Program

These are written in bold type and are the important divisions of the rules.

These are written in bold type and use the upper case alphabet. These are the major divisions of the rules.

The following study guide questions are taken from the Pennsylvania Department of Environmental Protection storage tank regulations, originally published September 21, 1991. These rules are contained in Title 25 of the Pennsylvania Code, Chapter 245. This reference is often abbreviated "Chapter 245."

The Pennsylvania rule is organized in an outline format using a system that works like this:

Subchapters: A,B,C,D,E,F,G,H

Sections 245.1 to 245.708

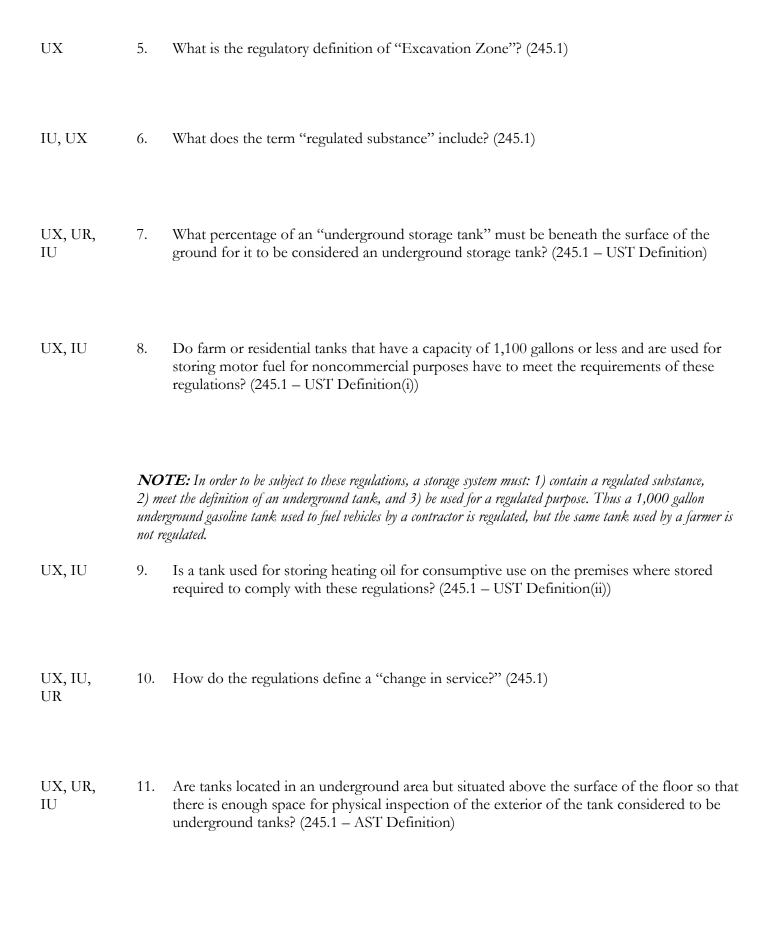
UX

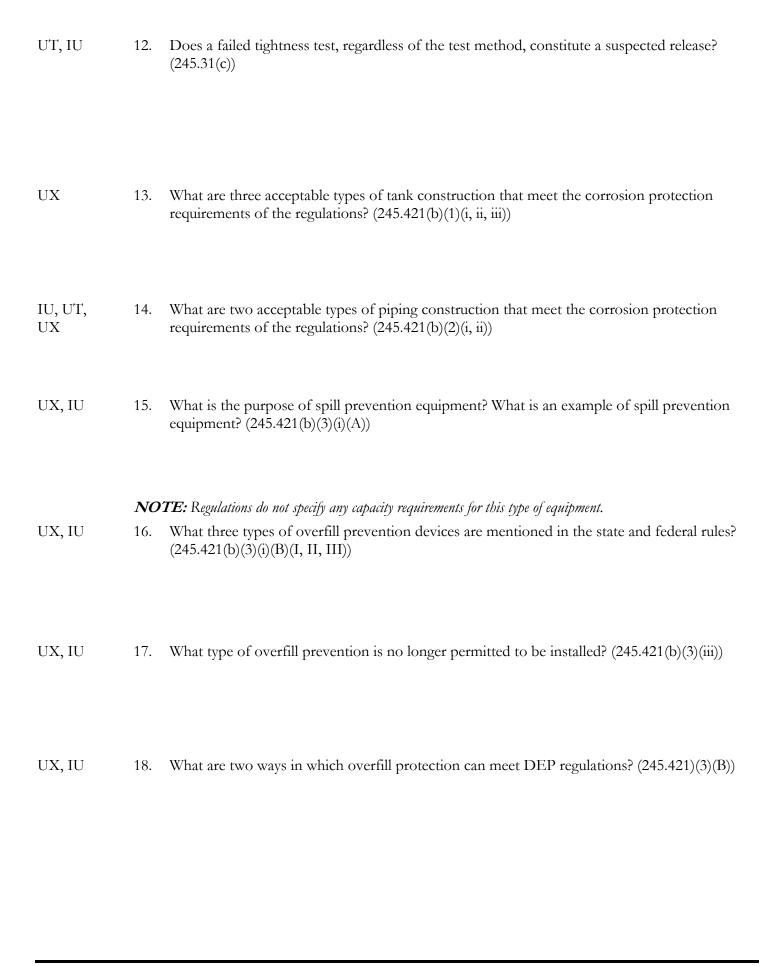
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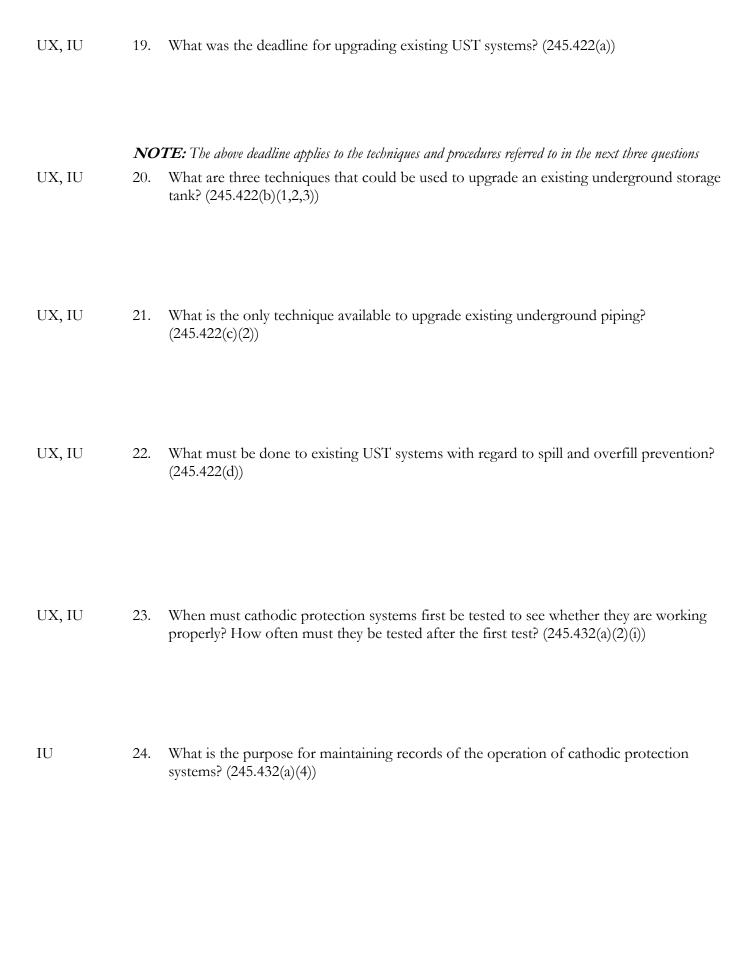
(a), (b), (c), etc (1), (2), (3), etc. (i), (ii), (iii), (iv), (A), (B), (C), (D	 , etc	The major divisions of a section are indicated by lower case alphabet letters in parentheses. The next lower divisions of a section are indicated by arabic numerals in parentheses. The next lower divisions of a section are indicated by roman numerals in parentheses. The next lower divisions of a section are indicated by upper case letters in parentheses.
heading to u	ındersta	lists to describe requirements, so it is often necessary to trace back the text to the next higher and what is being said. For example, section 245.2 (c) (1) states, "Will prevent releases due to aral failure for the operational life of the system."
	system	e much sense by itself. We must go back to 245.2(c) which says, "A person may not install a regulated under the act unless the system does the following," to determine that this is a k installers.
_		ficult, but with some practice and diligence it can be done. It is highly recommended that you ugh a section of the rules before you attempt to answer the study guide questions for that section.
UX, IU	1.	Is a hydraulic lift tank subject to these regulations? (245.1 – UST Definition (xv))
UX, IU	2.	Is an underground used oil tank with a capacity of 100 gallons subject to these regulations? (245.1 – UST Definition (xii))
UX, IU	3.	UST systems that store fuel solely for use by emergency power generators must meet

release detection requirements by what date(s)? (245.403(b))

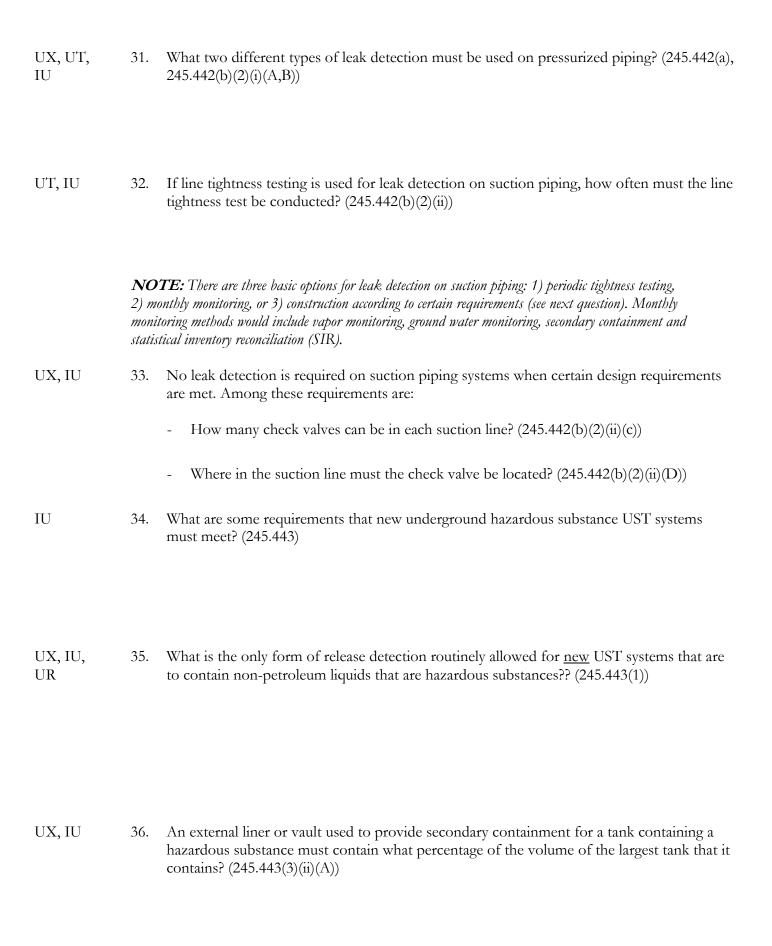
How do the regulations define "Corrosion Expert"? (245.1)

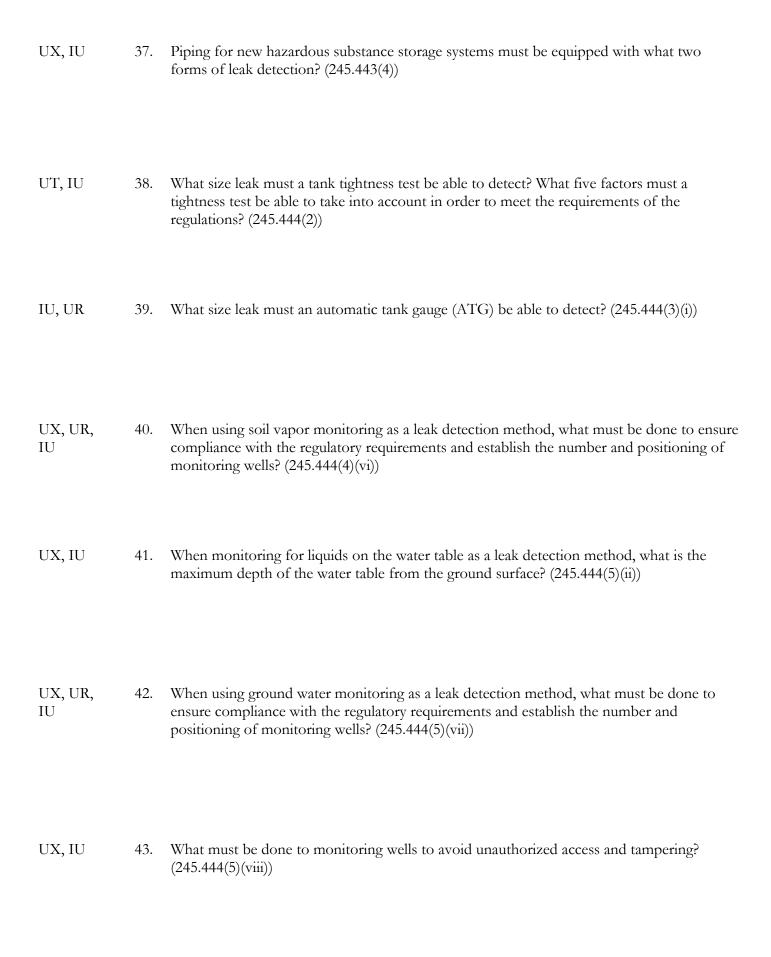


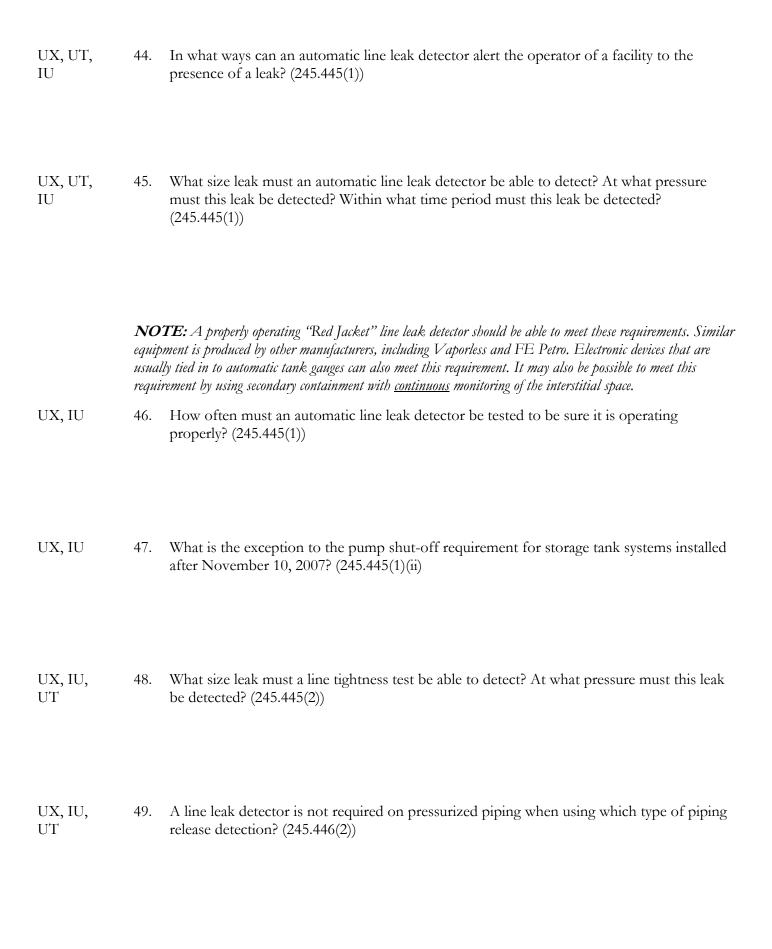


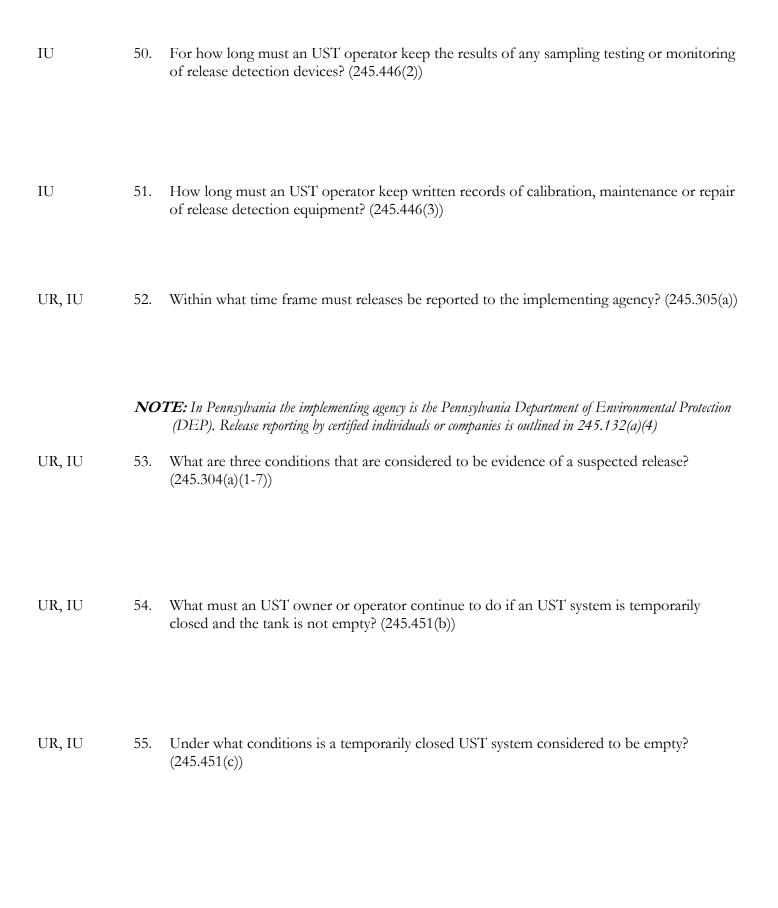


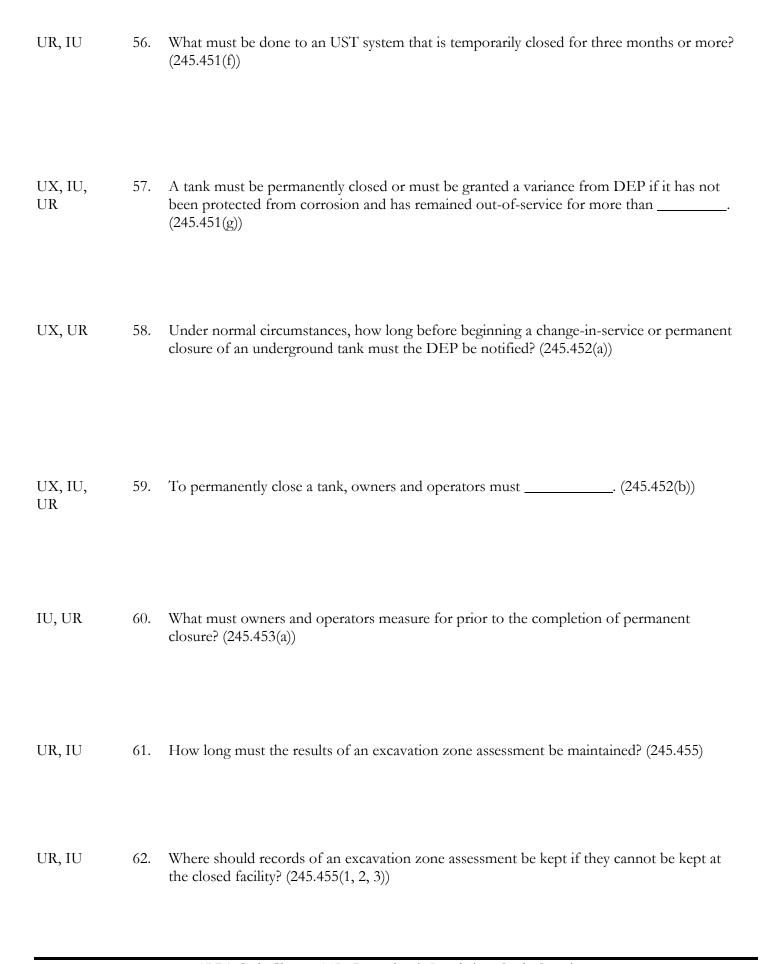
UX, IU	25.	Except for certain circumstances, what must be done to repaired tanks and piping prior to placing the underground storage tank system back into service? (245.434(4))
IU	26.	What must be done to cathodically protected UST systems within six months of completing a repair to the system? (245.434(5))
IU	27.	For how long must owners and operators of a repaired UST system keep a record of repairs done to the system in response to a release? (245.434(6))
UX, IU	28.	What portion of a tank system must have release detection? (245.441(a)(1))
IU	29.	How must release detection equipment be "installed, calibrated, operated and maintained?" (245.441(a)(2))
IU	30.	How often must tanks be monitored for releases when methods such as automatic tank gauges, ground water or soil vapor monitoring, or interstitial monitoring are used for release detection? (245.442)





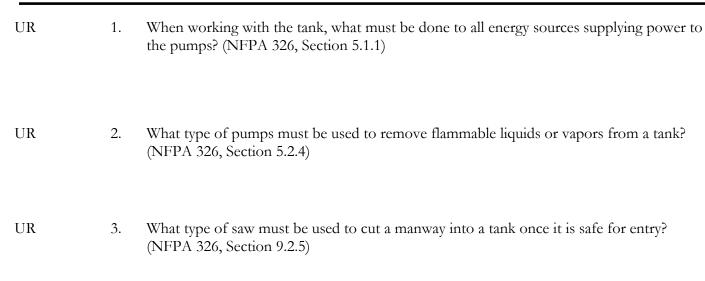






NFPA 326: Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair

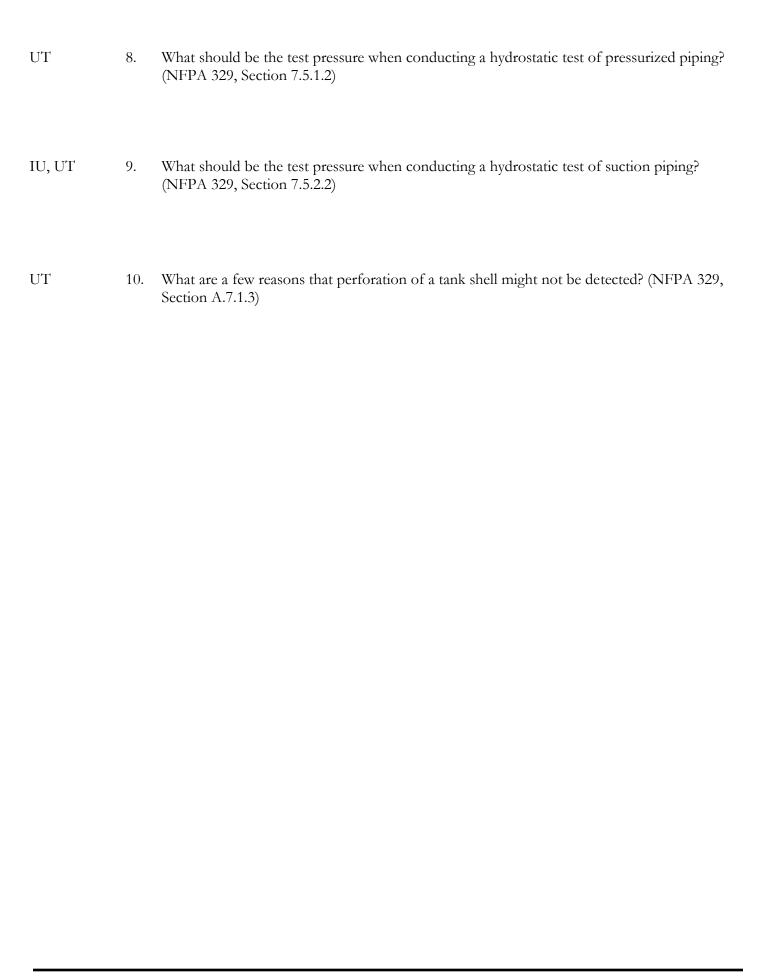
The following study guide questions are taken from National Fire Protection Association (NFPA) Code 326, "Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair," 2015 Edition.



NFPA 329: Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases

The following study guide questions are taken from National Fire Protection Association (NFPA) Code 329, "Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases" (2015 edition).

IU	1.	The areas around fill pipes where liquid is transferred should be checked for what? (NFPA 329, Section 6.2.7)
UT	2.	What are three indications that a leaking check valve or a leaking pipe may be present in a suction piping system? (NFPA 329, Section 7.2.3.2)
IU, UT	3.	A non-volumetric test is acceptable for leak detection, but what does it not quantify? (NFPA 329, Section 7.4.9)
IU, UT	4.	Pressure testing of tanks that contained flammable or combustible liquids can be done with what type of gas? (NFPA 329, Section 7.4.11.2)
IU, UT	5.	How is a leak indicated when a hydrostatic test of buried piping is conducted? (NFPA 329, Section 7.5.1.4)
IU, UT	6.	A hydrostatic test for pressurized piping should be conducted at what percent of the maximum anticipated pressure on the system? (NFPA 329, Section 7.5.1.2)
UT	7.	What are four conditions that can cause a loss of liquid pressure when conducting a hydrostatic test of piping? (NFPA 329, Section 7.5.1.5)



American Petroleum Institute

API 1604: Closure of Underground Petroleum Storage Tanks

The following questions were taken from the American Petroleum Institute Recommended Practice 1604, "Closure of Underground Petroleum Storage Tanks" Third Edition, March 1996, Reaffirmed 2010).

UR, IU	1.	What are the symptoms of inhaling high concentrations of petroleum hydrocarbon vapors? (API 1604, Section 1.3.1)
IU	2.	What is the first step in treating the minor effects of exposure to petroleum hydrocarbon vapors? (API 1604, Section 1.3.1)
UR, IU	3.	List six safe work practices closure personnel should follow to reduce health risks at a closure site. (API 1604, Section 1.3.1)
		a)
		b)
		c)
		d)
		e)
		f)
UR	4.	What component of leaded gasoline can cause diseases of the nervous system, the kidney and the blood? (API 1604, Section 1.3.1.2)

UR	5.	What is a major route of entry of tetraethyl lead into the body? (API 1604, Section 1.3.1.2)
UR, IU	6.	What are three types of precautions that must be taken to prevent the accidental ignition of explosive vapors at a tank removal site? (API 1604, Section 1.3.2.1) a)
		b) c)
UR, IU	7.	Under what circumstances is an UST considered to be temporarily out of service? (API 1604, Section 2.1)
UR, IU	8.	How long can a UST that meets regulatory standards for a new or upgraded system remain temporarily out of service? How long can a UST that does <u>not</u> meet regulatory standards stay out of service? What is required for an out of service UST that does not meet regulatory standards to obtain an extension of the out of service period? (API 1604, Section 2.1)
UR, IU	9.	What are six steps that should be taken to properly secure a tank that is to be temporarily out of service? (API 1604, Section 2.2) a) b) c) d) e) f)

10. How much product should be left in a tank in order to maintain a saturated vapor space when a tank is being placed temporarily out of service? (API 1604, Section 2.2)

NOTE: For gasoline, "saturated vapor space" is another way of saying that the concentration of flammable vapors is above the upper flammable limit, and so the vapors cannot burn or explode.

According to federal and Pennsylvania regulations, leak detection procedures must be maintained while a tank is out of service if more than one inch of product is left in the tank.

UR

- 11. What are four elements of a pre-closure evaluation that should be conducted prior to permanent closure or change-in-service? (API 1604, Section 3.3.1)
 - a)
 - b)
 - c)
 - d)

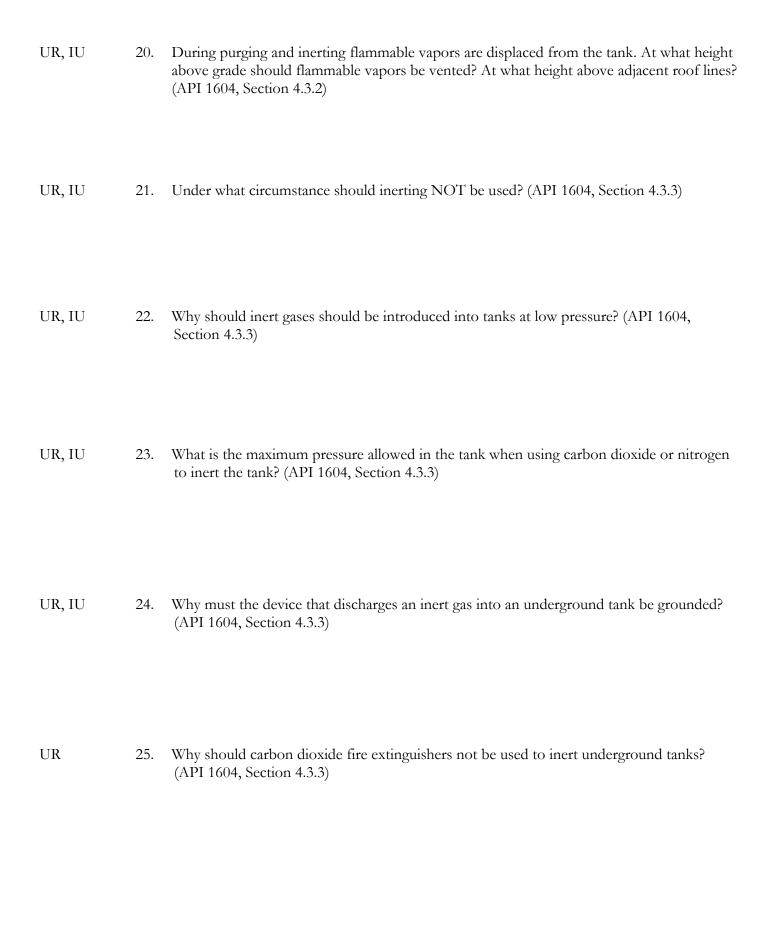
NOTE: In addition to the steps above, the Pennsylvania underground utility line protection act (Act 187 of 1996) requires notification by excavators, designers or any person preparing to disturb the earth's surface anywhere in Pennsylvania. Contractors must call the One Call System (1-800-242-1776) not less than three nor more than 10 working days in advance of beginning excavation or demolition work.

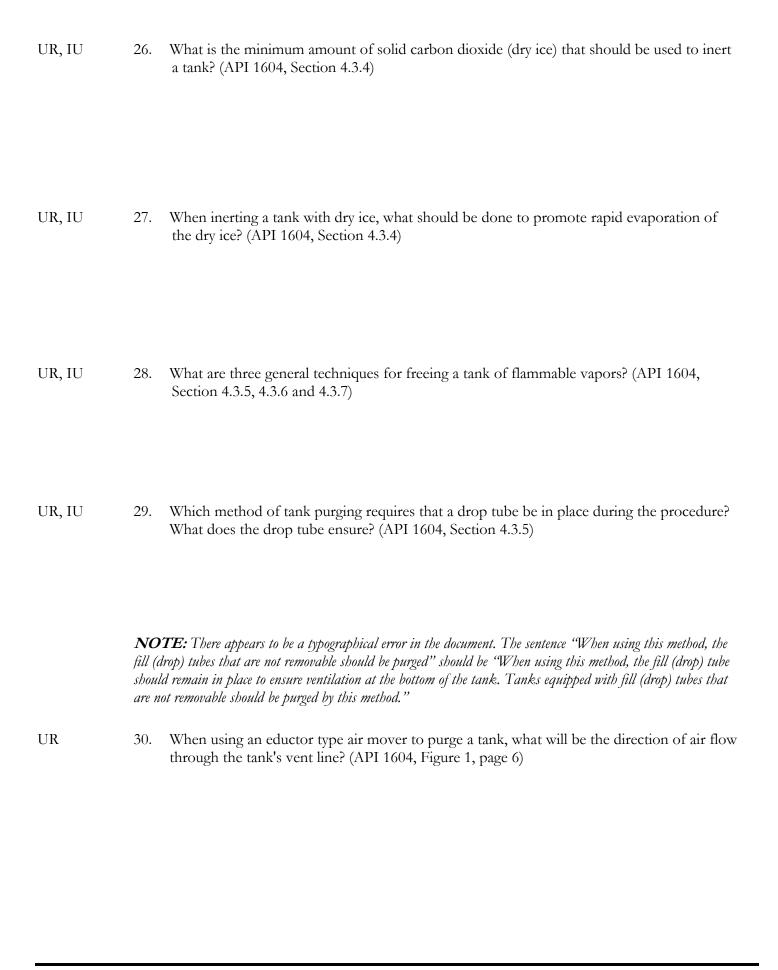
UR

12. During the closure operation, what should be done with the contents of the product piping? (API 1604, Section 4.2.2)

UX, UR, IU 13. If pumps are used to remove liquids and residues from an underground tank, what precaution must be taken to prevent electrostatic ignition hazards? (API 1604, Section 4.2.3)

UR, IU	14.	If a vacuum truck is used for removal of liquids or residues from an underground tank: (API 1604, Section 4.2.3)
		- The area of operation of the vacuum truck must be
		- The truck should be located from the tank.
		- Vacuum pump exhaust gases should be discharged through a hose of adequate size and length of the truck and tank area.
		TE: In May 1986, a tank worker in Portland, Maine was killed and several others were burned by an sion and fire resulting from the accidental ignition of vacuum pump exhaust from a vacuum truck.
UR, IU	15.	When closing tanks, after all the liquid product has been removed, what is the next step? (API 1604, Section 4.2.4)
UR, IU	16.	After removing product and exposing the top of the tank, what is the next step in closing a tank? (API 1604, Section 4.2.5)
UR, IU	17.	Once the top of the tank has been excavated and tank fixtures removed, all tank openings should be plugged except one. Which pipeline should remain connected to the tank? (API 1604, Section 4.2.5)
UR, IU	18.	What is the definition of purging? (API 1604, Section 4.3.1)
UR, IU	19.	What is the definition of inerting? (API 1604, Section 4.3.1)





UR	31.	When purging a tank using a diffused air blower, what must be done to prevent the discharge of a spark? (API 1604, Section 4.3.5)
UR	32.	What is the maximum allowable pressure in an underground tank when using a diffused air blower? (API 1604, Section 4.3.5)
UR, IU	33.	Until what point in the tank removal process should combustible vapor concentrations be measured in the tank and the excavation area? (API 1604, Section 4.4.1)
UR, IU	34.	At what level in a tank should combustible vapor concentrations be measured? (API 1604, Section 4.4.2)
UR, IU	35.	What lower explosive limit (LEL) readings must be obtained before a tank is considered safe for removal from the ground? (API 1604, Section 4.4.2)

UR, IU	36.	Under what circumstances should closure in place be considered? (API 1604, Section 4.5.1) a)
		b)
		c)
UR, IU	37.	What type of material should be used to fill a tank that is being closed in place? (API 1604, Section 4.5.4)
UR, IU	38.	After a tank that is being closed in place is filled with inert material, what is the next step? (API 1604, Section 4.5.5)
UR, IU	39.	When closing a tank in place, what is the last tank connection to be disconnected? (API 1604, Section 4.5.6)
UR, IU	40.	What should be done after a tank has been freed of vapors and before it is removed from the excavation? (API 1604, Section 4.6.1)
UR, IU	41.	After a tank has been freed of vapors, it should be sealed except for a 1/8 inch vent hole. Where should this vent hole be located during subsequent storage and transport? (API 1604, Section 4.6.1)

UR	42.	What should be used to prevent movement of a tank after it has been removed from the ground and prior to moving it off site? (API 1604, Section 4.6.2)
UR, IU	43.	What should be used to plug any corrosion holes in a tank that has been removed from the ground? (API 1604, Section 4.6.2)
UR, IU	44.	At what point during the removal process should a tank label listing precautions regarding used petroleum storage tanks be affixed to the tank? What is the minimum recommended size of letters on this label? (API 1604, Section 4.6.4)
UR, IU	45.	What four items of information should be included in the tank label? (API 1604, Section 4.6.4)
UR	46.	"Lead vapors may be released if heat is applied to the tank shell." These words should be part of the label applied to what tanks? (API 1604, Section 4.6.5)

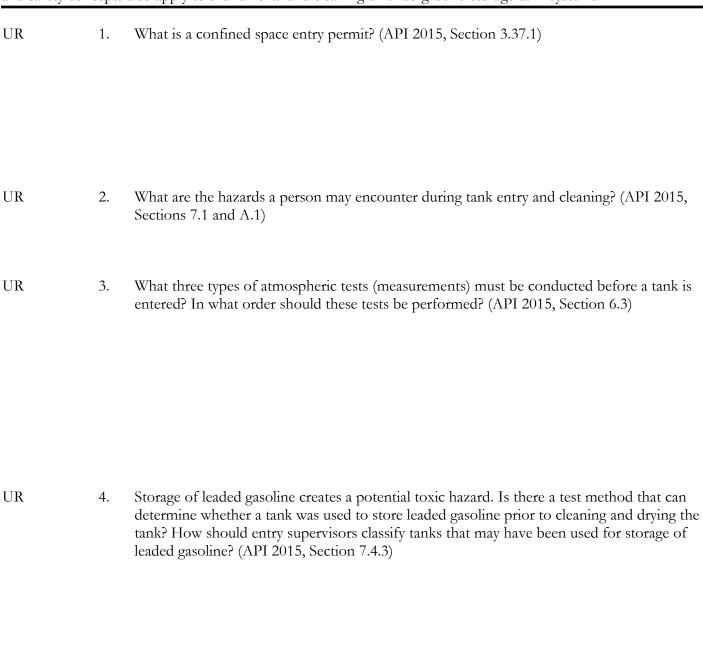
UR, IU	47.	For safety sake, what measurement should be made before a tank is removed from a site? (API 1604, Section 4.6.6.1)
UR, IU	48.	What size vent hole is required for tanks that are in storage? What should be done to all other tank openings? (API 1604, Section 5.2.1)
UR, IU	49.	Where should used tanks be stored? (API 1604, Section 5.2.2)
UR, IU	50.	Before being sold for scrap or otherwise disposed of, what should be done to an underground tank? (API 1604, Section 7.1.1)
UX, UR, IU	51.	Prior to re-use, tanks must be recertified by (API 1604, Section 7.1.2)

American Petroleum Institute

API 2015: Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks

The following questions were taken from the American Petroleum Institute's Publication 2015, "Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks" (Eighth Edition, January, 2018).

Please note: Although these standards were developed for aboveground storage tank systems, many of the health and safety concepts also apply to the removal and cleaning of underground storage tank systems.



UR	5.	What is an example of a petroleum compound that has the potential to cause cancer? (API 2015, Section 7.4.5)
UR	6.	When vapor freeing (purging) a tank, where should measurements (tests) of vapor levels be conducted? (API 2015, Section 6.3.4 and 6.3.5)
UR	7.	How long should the ventilation system be shut down before testing the interior of a tank? (API 2015, Section 6.3.5)
UR	8.	The tank must be emptied of all recoverable product through (API 2015, Section 5.2.2)

UR	9.	What are three factors that may result in a fire or explosion when there is a source of ignition inside or near a tank? (API 2015, Section 7.3.3)
UR	10.	What is the definition of "hot work"? (API 2015, Section 11)
UR	11.	In a tank where hot work is being done, what should the flammable vapor-in-air atmosphere not be in excess of? (API 2015, Section 11.2.3.1)
UR	12.	What are the three elements necessary for fire or explosion to occur? (API 2015, Section A.1.3.2) a) b) c)
UR	13.	Why is the elimination of ignition sources difficult? (API 2015, Section A.1.3.2.3)
UR	14.	What is a highly toxic, colorless, flammable gas that has a rotten egg smell and is dangerous in low concentrations?

UR	15.	What is the reading on an oxygen analyzer that indicates the oxygen content is below the breathing range and respiratory equipment must be worn? (API 2015, Section A.1.2.4)
UR	16.	Death or brain damage can occur within minutes breathing in an oxygen deficient atmosphere. Do workers in an oxygen deficient atmosphere without respiratory equipment usually notice that they are not getting enough oxygen? (API 2015, Section A.1.2.4)
UR	17.	What are four ways that toxic substances can enter the body? (API 2015, Section A.1.6.2) a) b) c) d)
UR	18.	What is the definition of an irritant? (API 2015, Section A.1.6.2.1)
UR	19.	After the tank has been emptied of gasoline, what is the primary source of organic lead hazard in tanks? (API 2015, Section A.1.8)
UR	20.	By what routes can toxic lead alkyds enter the body? (API 2015, Section A.1.8.3)

UR	21.	What personal protective equipment is required for entry into tanks that contained organic lead? (API 2015, Section A.1.8.3)
UR	22.	What two ways are vapors freed from a tank? (API 2015, Section B.1.1)
		API 2015– Safe Entry and Cleaning of Tanks Study Questions

New England Interstate Water Pollution Control Commission

Tank Closure Without Tears

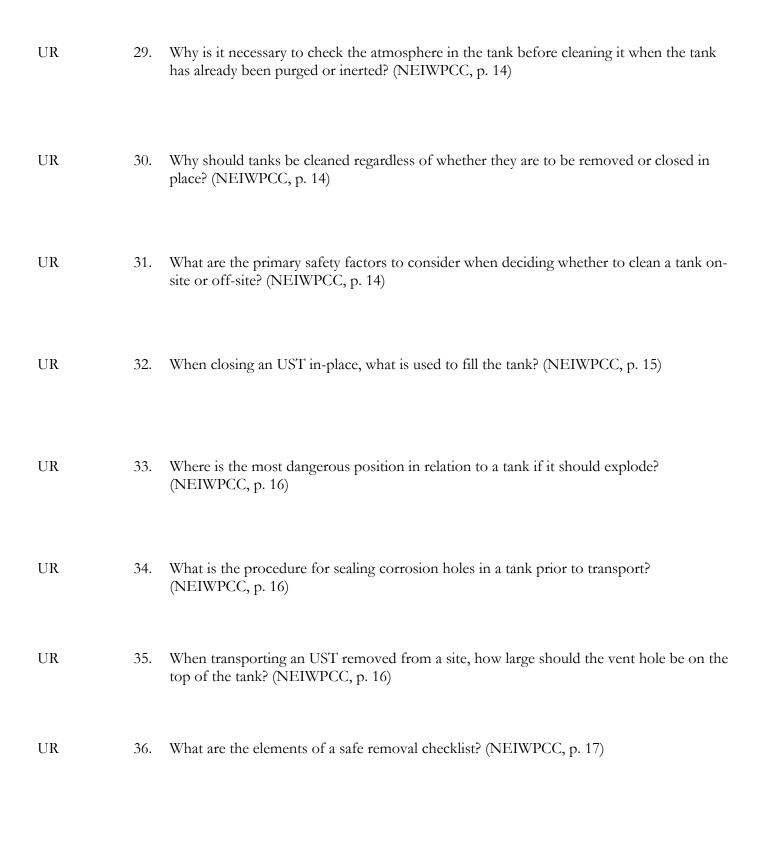
The following questions are taken from the New England Interstate Water Pollution Control Commission publication, "Tank Closure Without Tears: An Inspector's Safety Guide" (May 1988, Reprinted May 1991).

UR	1.	What are the three points of the basic fire triangle? (NEIWPCC, p. 2) a)		
		b)		
		c)		
UR	2.	How many points of the fire triangle are necessary to support combustion? (NEIWPCC, p. 2)		
UR	3.	Movement of which of the following causes static electricity: liquids, air or solids? (NEIWPCC, p. 3)		
UR	4.	What must be eliminated prior to the use of heavy equipment for handling the tank? (NEIWPCC, p.3)		
UR	5.	If static-producing movement can not be eliminated, how can the contractor provide a "safe" discharge of static electricity? (NEIWPCC, p. 3)		
UR	6.	How can electrostatic ignition hazards be reduced when removing product or residue from the tank? (NEIWPCC, p. 3-4)		

UR	7.	Why should plastic (PVC) pick-up tubes be avoided on the stripping lines of vacuum trucks? (NEIWPCC, p. 4)
UR	8.	Where should the vacuum truck be in relation to the tank when removing liquid or residues from a tank? Where should exhaust hoses be situated relative to the tank? (NEIWPCC, p. 5)
UR	9.	How does purging work? Which point of the fire triangle is dealt with in purging the potentially explosive atmosphere in a tank? (NEIWPCC, p. 5)
UR	10.	What is the flammable range of vapor given off by most petroleum products? (NEIWPCC pp. 5-6)
UR	11.	Below the lower explosive level (LEL) the mixture of fuel and vapor in a tank is too lean to support combustion. What is the LEL for petroleum products? (NEIWPCC, p. 6)
		TE: It is very important to individuals health and safety that they understand the relationship between nable range of vapor and lower explosive level. Refer to the charts and text on page 8 for more information.
UR	12.	What is the goal of purging? (NEIWPCC, p. 6)
UR	13.	How does inerting work? Which point of the fire triangle is dealt with in "inerting" the atmosphere of a tank? (NEIWPCC, p. 6)

UR	14.	What is the goal of inerting a tank? (NEIWPCC, p. 6)
UR	15.	Why is it especially important to control sources of ignition when purging an underground tank with air? (NEIWPCC, p. 6)
UR	16.	Which method of purging with air pumps fresh air into the tank and which one draws vapors out of the tank? (NEIWPCC, pp. 6-7)
UR	17.	When purging a tank, one should NOT use (NEIWPCC, p. 7)
UR	18.	Once a tank has been purged, is there any need to continue monitoring it for flammable vapors? (NEIWPCC, p. 7)
UR	19.	When testing with a Combustible Gas Indicator (CGI), a reading of 100 percent LEL would indicate that what percent of gasoline vapors were present? (NEIWPCC, p. 8)
UR	20.	What substances can foul or "poison" a CGI probe? (NEIWPCC, pp. 8-9)

UR	21.	When inerting, how can carbon dioxide be generated? (NEIWPCC, p. 9)
UR	22.	When inerting a tank with dry ice, how many pounds of dry ice should be used for every 1,000 gallons of tank capacity? (NEIWPCC, p. 9)
UR	23.	What are two ways to reduce the concentration of oxygen in a tank to a level that is insufficient to support combustion? (NEIWPCC, p. 9)
UR	24.	What readings on an oxygen meter indicate a non-combustible atmosphere in tanks that have contained most petroleum products? What readings should you target for a more conservative safety rule of thumb? (NEIWPCC, p. 11)
UR	25.	What percent oxygen by volume indicates a safe range for breathing? (NEIWPCC, p. 11)
UR	26.	Should a single point of the fire triangle be the focus of efforts to avoid fire and explosion during tank closure? (NEIWPCC, p. 12)
UR	27.	Can a combustible gas indicator be used to monitor a tank which is being inerted? Why or why not? (NEIWPCC, p. 13)
UR	28.	What is the definition of "flashpoint"? (NEIWPCC, p. 13)



Petroleum Equipment Institute

PEI RP-1200: Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities

The following study guide questions are taken from the Petroleum Equipment Institute's "Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities" (PEI RP-1200-2012).

UX, IU, UT	1.	What can visually indicate a test failure during integrity testing of a spill bucket? (PEI, Section 6.3.4)
UX, IU, UT	2.	How high should the test fluid level be when doing a hydrostatic test of a containment sump? (PEI, Section 6.5.6 and Figure 6-7)
UX	3.	Flow restriction and overfill alarms are required to engage when the tank getsfull. (PEI, Section 7)
UX	4.	When does an automatic shutoff device pass an inspection? (PEI, Section 7.1.7)
UX, IU, UT	5.	How does an ATG probe pass a functionality test? (PEI, Section 8.2.1.7)



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