BODY OF KNOWLEDGE
TANK ENTRY SUPERVISOR CERTIFICATION PROGRAM

This API Individual Certification Examination is designed to identify applicants possessing the required knowledge to serve as tank entry supervisors. API certified Tank Entry Supervisors must have knowledge of planning and preparation to address potential hazards and achieve safe work conditions during tank entry, ventilation, conducting work and completing the job. This includes knowledge of storage tanks & their construction. Emphasis is placed on entry into aboveground petroleum storage tanks and work associated with tank cleaning. The examination includes subject matter from API Standards, government regulations and additional publications indicated in the cited references. Candidates are given eight hours to complete the examination. Questions for the examination are multiple-choice with open and closed book sections.

REFERENCE PUBLICATIONS:
The primary references for the Tank Entry Supervisor Certification examination are ANSI/API Standard 2015, which defines requirements, and its companion ANSI/API RP 2016, which provides guidance for developing and safely implementing plans in accordance with requirements of API 2015. These standards provide substantial experience-based practical information; they also incorporate by reference additional background material from API and other sources, including cited U.S. Federal (but not state) regulations.

Note: Refer to the Publications Effectivity Sheet in the application package for a list of which editions, addenda, and supplements of the reference publications are effective for your exam.

A. API PUBLICATIONS

ANSI/API STD 2015	***Requirements for Safe Entry & Cleaning of Petroleum Storage Tanks***
ANSI/API RP 2016	***Guidelines& Procedures for Entering & Cleaning Petroleum Storage Tanks***
API 2026	***Safe Access/Egress Involving Floating Roofs of Storage Tanks in Petroleum Service***
Pub. 2207	***Preparing Tank Bottoms for Hot Work***
Pub. 2219	***Safe Operation of Vacuum Trucks in Petroleum Service***

B. ACGIH (American Conference of Governmental Industrial Hygienists) *Publication*

Threshold Limit Values [TLVs®] for Chemical Substances and Physical Agents
In the Work Environment and Biological Exposure Indices [BEIs®]

C. U.S. OSHA REGULATIONS

29 Code of Federal Regulations (29 CFR) Parts 1910 & 1926

1910.38	***Employee Emergency Plans and Fire Prevention Plans***
1910.132-138	***Subpart I - Personal Protective Equipment***
1910.146	***Permit-Required Confined Spaces***
1910.147	***Control of Hazardous Energy (Lockout/Tagout)***

1910.1000 (and following) ***Subpart Z, "Toxic and Hazardous Substances"***
1910.1200 ***Hazard Communication***
1926.404 ***Subpart K - Electrical***
The above OSHA Regulations can be downloaded free of charge from the OSHA web site www.osha.gov

(NOTE: The API Examination Application includes a section called "Publication Effectivity". This lists the references considered in effect for the specific examination. Section or paragraph references listed in this Body of Knowledge should be checked for accuracy using the effective edition for the date of the examination. References listed for a topic are relevant, but not exclusive. Other referenced material may also address the subject area.)

T.E.S. EXAMINATION KNOWLEDGE EXPECTATIONS:

Similar Knowledge Items, which Appear in the General Section or in Subject Sections May Not Be Repeated in the Same Detail in Subsequent Sections, but May Appear as part of Questions on the Examination.

***GENERAL KNOWLEDGE* APPLICABLE TO MORE THAN ONE AREA:**

This certification recognizes that while Tank Entry Supervisors direct work they also fulfill a primary Health & Safety role. ANSI/API 2015 & 2016 are the primary references, supplemented by additional API standards. The API standards are not regulatory compliance guides; however, some aspects of confined space entry are regulatory issues, and it is necessary to know the relevant OSHA regulations. ***[Note – the examination questions do not address state regulations which may differ from federal.]***

a) For Permit Required Confined Space (PRCS) entry U.S. OSHA defines responsibilities in 1910.146(j) for Supervisors, 1910.146(h) for entrants and 1910.146(i) for attendants. ANSI/API 2015 & 2016 expand guidance to cover areas not addressed by OSHA, including non-permit required confined spaces and non-confined spaces.
b) Hazard recognition, identification, communication and control are key activities throughout the various project stages. Numerous safety aspects are addressed throughout ANSI/API 2015 & 2016. These include non-regulatory issues such as changes in conditions which might affect personnel while work in is in progress as well as regulatory requirements for hazard assessment [OSHA 1910.132(d)], selection and use of PPE [OSHA 1910.132→ 1910.138] and hazard communication [OSHA 1910.1200].
c) Mention of various permits for work or entry appears throughout the references. API 2016 Sections 10.7 & 10.8 provide example permits and discussion for tank cleaning and entry.
d) Training and personnel qualifications, significant for job performance and regulatory compliance, are required for most of the roles related to tank entry and cleaning. [API 2016 Section 4.4]
e) Definitions from Section 3 of both ANSI/API 2015 & 2016 and from the other references [including OSHA regulations] relate to questions throughout the test.
f) API 2016 Section 10 provides checklists, examples and implementation guidance, which address most aspects of API 2015 & 2016 related to tank cleaning.
g) Electrical equipment used inside tanks and around tank cleaning activities shall conform to accepted safe work practices [API 2015 Section 5.5; API 2016 Sections 9 & 10] and OSHA Subpart K.

The TES ICP test does not include specific environmental regulations. Applicants should be aware that federal and state environmental regulations have permit or reporting requirements for emissions of hydrocarbons or chemicals to the air, or spills to the ground or water [API 2015 Section 5.1.1].

CANDIDATES ARE EXPECTED TO DEMONSTRATE KNOWLEDGE IN THE PRECEDING GENERAL AREAS AND IN THE FOLLOWING SUBJECT AREAS:

1. PROJECT PLANNING (not including field work)
[API 2015 Section 4; API 2016 Sections 1 & 10]
Project planning includes identifying and understanding all work phases required to safely complete an above-ground storage tank entry and cleaning project including the ability to identify requirements for properly trained and qualified workers for each activity

***PROJECT PLANNING* QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

a) Determining the specific scope of work, including methods and who will be responsible for each phase [owner, contractor, subcontractor], the qualifications and training requirements for all personnel and developing a safe work plan
b) Determining tank construction/configuration/type, including appurtenances and roof-type (2016 Section 7). Hazard identification includes tank physical condition and safety hazards associated with the tank [API 2016 Section 10.3.2 & Section 12]
c) Identifying materials in the tank to be entered (such H_2S, benzene, lead, pyrophorics), the materials to be used to clean or repair the tank, and their associated hazards and establishing a hazard communication plan following the owner/contractor Haz Com program and conforming to: OSHA 1910.1200; API 2015 Section 5.1.1.2; API 2016 Section 4; and OSHA 1910.132(d).
d) Developing a site plan (with a site review and site walk), including identification of adjacent hazards and potential hazards that may impact on the work area [Section 10.2 text and figures].
e) Understanding the respective duties of Permit Required Confined Space (PRCS) entrants [1910.146(h)], attendants [1910.146 (i)] and supervisors [1910.146 (j)].
f) Establishing confined space classification requirements and permit (entry, hot and cold work) requirements in accordance with owner/contractor confined space and permit programs [API 2015 Section 1.5 & 4.2; API 2016 10.2.3 & OSHA 1910.146]
g) Determining methods for disposal/recycling products and residue [2016 Sections 6 & 10.3]
h) Determining emergency response requirements (including rescue) and identify and qualify responders [2015 Section 13; 2016 Section 10.2.9 text and figures; OSHA 1910.146 (including 1998 appendix F revisions); OSHA 1910.38 general requirements.
i) Determine necessary regulatory permits [2015 Section 5.6.4]
j) Determine safety procedures (e.g., lockout/tagout, hot work) required for work to be done.

2: TANK PREPARATION

[API 2015 Section 5; API 2016 Sections 10 & 12; API 2219]

The goal of tank preparation is to make the area around a tank and the atmosphere inside a tank safe for human occupancy. Occupancy occurs during cleaning, while performing internal maintenance and inspection. Preparing the tank prior for decommissioning includes establishing basic permitting requirements; assigning specific responsibility for each phase of operation; removing and safe handling of product from the tank; and proper isolation of the tank space and the adjacent work site.

***TANK PREPARATION* QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

a) Obtaining necessary facility permits or work orders required for tank preparation. This includes: recognizing need and obtaining confined-space permits (if required) for equipment placement, setting legs, and hand gauging
b) Hand-gauging the tank to ensure safe level for opening tank
c) Recognizing the potential for descent onto a floating roof to be confined space entry [API 2016 Section 10.3.2 & Section 12; API 2026].
d) Setting floating roof legs after obtaining any necessary work permits [API 2015 Section 5.3.1].
e) Positioning ancillary equipment outside of tank
f) Isolating tank (lock out/tag out/blinding/disconnecting) [API 2015 Section 5.4; OSHA 1910.147] including cathodic protection system (if provided) [API 2015 Section 5.4.4]
g) Bonding eductor (s) to the tank to minimize the risk of static electricity as an ignition source (2016 Section 9.5; OSHA 1926.404]
h) Placing eductors to disperse vapors/control emissions prior to opening manways and then slowly starting an eductor while opening manways (to protect manways from emitting vapors) and testing for toxics, as required [2016 Section 10.3.7]
i) Removing recoverable product in the following sequence [API 2016 Section 6; API 2219]:

- Drawing as much as possible through tank piping/fixed connections
- Removing additional recoverable material through water draws (and similar connections) without opening tank
- Removing as much remaining product and sludge as possible through the manway using pump and vacuum (bonded to the tank and grounded)

3: VENTILATION AND ATMOSPHERIC TESTING

Ventilation includes the proper placement and operation of degassing, ventilation and/or inerting equipment. Atmospheric testing is used to evaluate the effectiveness of the ventilation to ensure that safe working conditions are met and maintained during the entire work process

***VENTILATION AND ATMOSPHERIC TESTING* QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

VENTILATION [API 2016 Section 5]

a) Knowing the difference between degassing, ventilating and inerting [2016 Section 5.6].
b) Determining degassing, ventilation or inerting requirements and equipment needed
c) Knowing how to ventilate and where to place equipment [2016 Section 5.3 text, figures and examples].
d) Knowing how to degas and where to place equipment [2016 Section 5.8 text and figures].
e) Knowing how to inert gas purge and where to place equipment [2016 Section 5.6].
f) Understanding the hazards associated with inerting [API 2015 Section 7.2].
g) Calculating necessary flow rates for required ventilation air changes [API 2016 Section 5.3.3 text and examples]
h) Placing and bonding eductors (fans), to ventilate (or degas) the tank in preparation for entry

***ATMOSPHERIC TESTING* [API 2015 Section 6; API 2016 Sections 4, 10 & 11]**

a) Knowing qualifications, and identifying, qualified testers (entrants), attendants and rescuers
b) Determining necessary testing instrumentation [2015 Section 6 and 2016 Section 11]
c) Conducting initial atmospheric testing from outside the tank (without entry) to determine if condition inside tank meets entry requirements
d) Understanding the difference between PELs (regulatory exposure limits OSHA 1910.1000 →) and TLVs® (widely used non-regulatory exposure limit recommendations) [TLV booklet section on "Introduction to the Chemical Substances"; API 2016 Section 4.4.3 & Definitions]
e) Recognizing that listed PEL or TLV® values in ppm are orders of magnitude lower than percent flammability values and that atmospheres with zero flammability may have unacceptable chemical concentrations in the confined space greater than PEL or TLV® exposure levels [API 2016 11.4.1.1]. Since one percent equals 10,000 parts per million the concentration of the flammable material would be:
f) Percent (v) flammable material in air at LEL x percent LEL meter reading (as decimal) x 10,000 = ppm.
g) Recognizing the need for 10% minimum oxygen for catalytic flammability meters to work properly [2016 Section 11.3.2.1]
h) Understanding approaches for corrective actions, if necessary, and continuing ventilation (or degassing) and retesting until the tank is safe to enter
i) Issuing permits for initial entry of testers into the tank to conduct internal atmospheric testing and inspection.

4: INITIAL ENTRY FOR VISUAL INSPECTION AND EVALUATION [API 2015 Section 5, 7 & 8; API 2016 Sections 8 & 10]

Initial entry for visual inspection and evaluation includes tank entry under permit conditions, while monitoring the atmosphere, inspecting the tank, determining potential sources of vapor and evaluating the work plan for the required maintenance operation. Continuing ventilation (degassing) until requirements for entry to work are attained. Identifying and assigning entrants; attendants and rescuers. Establishing specific requirements for stopping work and exiting the tank.

***INITIAL ENTRY* TEST QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

a) Identifying and addressing residual special hazards (such as H_2S, benzene or lead exposure, pyrophorics, physical hazards, poor condition of tank bottom or roof supports) [API 2015 Section 7 & 8; 2016 section 8; OSHA 1910.1200 MSDS; OSHA 1910.132]
b) Conducting hazard assessment and specifying PPE requirements for entry (OSHA 1910.132 –38 [esp 132(d) – Hazard assessment and equipment selection and 1910.134 Respiratory Protection]; API 2015 Sections 4, 7 & 8; API 2016 Section 4 & 10)
c) Procedures to communicate with, and notify, tank operator of intent to enter and reason for entry; obtaining all necessary permit signatures.
d) Implementing confined space entry program and emergency response plan
e) Conducting testing and authorizing entry permit for inspection
f) Performing tank pre-cleaning safety inspection and visual inspection for work plan [API 2016 Section 10 text and figures]
g) Verifying and revising the scope of work [if required] in consultation with the tank owner.
h) Specifying work to be done and verifying the tank is safe to enter

5: CLEANING A TANK

[API 2015; API 2016 (especially Section 10) including examples and figures; API 2219]

Cleaning a tank includes: evaluating potential hazards and determining PPE requirements for those conducting the cleaning work; issuing entry and work permits; protecting against leakage into the tank; disposing of products and residue; providing for continued ventilation and testing of the atmosphere during maintenance activities. Additional duties include establishing requirements for canceling permits with work stoppage, exiting and closing the tank and retesting before reissuing permits to resume work. The tank shall be closed when unattended and retested and evaluated before reentry. Requirements shall be determined to enable reclassifying a tank into another entry category.

***TANK CLEANING* QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

Implementing the cleaning plan, including entry and cold work permits in conformance with a confined space entry plan

a) Maintaining ventilation; continuously (or periodically) test tank internal atmosphere for hazards
b) Monitoring potential and actual external hazards
c) Identifying and addressing special physical, toxic, and ignition hazards (for example, pyrophorics, H_2S, physical condition, and chemical cleaners)
d) Using appropriate electrical equipment [API 2016 Sections 9 & 10; OSHA Subpart K].
e) Monitoring activities and qualifications of cleaning personnel
f) Maintaining site security and securing access to avoid inadvertent entry into a confined space when the tank is unattended

g) Ensuring continuity of supervision during operations
h) Canceling permits, stopping work, and exiting the tank should conditions change and introduce hazards. Determining hazard cause, making tank safe, retesting and reissuing permits to restart work after permit cancellation
i) Confirming disposal of sludge and residue in accordance with plan
j) Verifying completion of cleaning

6: TANK ENTRY FOR REPAIRS OR MODIFICATIONS AFTER CLEANING
[API 2015 Sections 11 & 12; API 2016 Sections 10 & 12; API 2207]

Entry for repairs/modifications includes: considering the tank to be a permit required confined space until tested and determined otherwise; establishing atmospheric monitoring procedures to determine need and adequacy of ventilation; determining work to be performed and reclassifying tank for various phases of work. Conduct testing and issuing entry and work permits. Conducting work. Inspecting and testing to assure work has been performed as required and that all connections are in place. After work is completed, removing all equipment, tools, parts, debris, etc. from inside and around the tank and (physically) cleaning the tank and surrounding area.

***TANK ENTRY FOR REPAIR OR MODIFICATION* QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

a) Special precautions needed for entry onto an external floating roof or into internal floating roof confined spaces [API 2016 Section 10.3.2 & Section 12; API 2026 Section 4]
b) Implementing work plan and confined space entry plan
c) Specifying exposure limits and PPE for entrants, testers, attendants, and rescuers [OSHA 1910.1200 MSDS; ACGIH TLVs®]
d) Implementing emergency response plan [API 2015 Section 13; API 2016 Section 10.2.9 text and figures; OSHA 1910.38 & 1910.146]
e) Determining classification of tank (confined or non-confined space) [API 2015 Definitions & 4.2.7]
f) Conducting tests to determine if entry conditions are acceptable and issuing entry permit (if needed) and hot work and cold work permits [API 2016 Section 10.8 text & figures; API 2207]
g) Monitoring internal and external hazards, including identifying and addressing special hazards
h) Monitoring activities to assure performance and qualifications of workers
i) Maintaining site security and closing tank when unattended to avoid inadvertent or unauthorized entry (unless classified as a non-confined space)
j) Ensuring continuity of supervision during operations
k) Canceling permits to stop work, exit tank, and make tank safe should permit conditions change.
k) Reissuing permits to reenter (if needed) and continue work

7: RETURNING TANKS TO SERVICE
[API 2015 Section 14; API 2016 Section 10.9 text & figures]

Return to service includes inspecting the tank prior to closing to assure work has been performed in accordance with the plan and tank is clean and ready to go back into service. Closing tank in accordance with procedures. De-isolating tank. Filling tank in accordance with procedures. Gauging and sampling as required.

***RETURNING TANKS TO SERVICE* QUESTIONS MAY BE BASED ON THE FOLLOWING TOPICS:**

a) Inspecting tank (contractors, owners, and regulatory agency, if required) prior to closing to assure:
    1. Work has been performed according to plan
    2. Tank is clean
    3. Equipment and tools have been removed
    4. Tank is ready to go back into service.

b) Verifying that recommissioning activities are complete in accordance with plan
c) Coordinating with operations personnel regarding tank status
d) Addressing and notifying appropriate persons regarding changes in configuration of tank (i.e., management of change), when necessary
e) Securing tank and cleaning the area
f) Conducting post-entry debriefing with appropriate personnel to provide information for revisions in contractors and/or facility programs.

D. U.S. OSHA COMPLIANCE ASSISTANCE PUBLICATIONS

Only the cited regulations themselves are the references. The following compliance assistance documents from OSHA are not included as listed references for the TES test. They may help explain the subjects of cited OSHA regulation. The reader should be aware that these are explanations of principle and practice as perceived by OSHA, often are broader in scope than the specific regulations, and do not constitute formal OSHA interpretations.

OSHA 3088	***How to Plan for Workplace Emergencies and Evacuations* -- 2001 (Revised)**
OSHA 3151-12R	***Personal Protective Equipment* – Revised 2003**
OSHA 3138-01R	***Permit-Required Confined Spaces* – Revised 2004**
OSHA 3120	***Control of Hazardous Energy [Lockout/Tagout]* -- 2002 (Revised)**
OSHA 3111	***Hazard Communication Guidelines for Compliance* -- 2000 (Reprinted)**
OSHA 3084	***Chemical Hazard Communication* -- 1998 (Revised)**
OSHA 3075	***Controlling Electrical Hazards* -- 2002 (Revised)**
OSHA 2254	***Training Requirements in OSHA Standards and Training Guidelines* -- 1998 (Revised)**
OSHA 3007	***Ground-Fault Protection on Construction Sites* -- 1998 (Revised)**

The above OSHA Publications can be downloaded free of charge from the OSHA web site www.osha.gov