



**BODY OF KNOWLEDGE FOR
API 982 REFRACTORY INSPECTOR
CERTIFICATION EXAM**

For: August 2024 – April 2025

API Refractory Inspectors must have a broad knowledge relating to inspection, quality control, and repair of in-service refractory. The exam is designed to identify applicants possessing the required knowledge.

The exam consists of 150 scored questions and 15 pretest questions; and runs for 4 hours; no references are available during the exam, and nothing may be brought into the testing center.

The exam focuses on the content on API 982 and other referenced publications.

The following body of knowledge will identify references where specific knowledge may be found, but these references are not exclusive to all others.

REFERENCE PUBLICATIONS:

- **API RP 982**, Inspection and Assessment of Refractory Linings
- **API Standard 560**, Fired Heaters for General Refinery Service, Section 11 only
- **API Pub 935**, Thermal Conductivity Measurement Study of Refractory Castables
- **API TR 977**, ASTM C704 Test Variability Reduced to Allow Further Optimization of Erosion-resistant Refractories for Critical Oil Refining Applications
- **API TR 978**, Monolithic Refractories: Manufacture, Properties, and Selection
- **API TR 979**, Applications of Refractory Lining Materials
- **API TR 980**, Monolithic Refractories: Installation and Dryout
- **API TR 981**, Thermal Expansion Under Load and Creep of Refractories - An Evaluation and Comparison of Testing Methods

Unless otherwise noted, the whole document is subject to testing.

Note: Refer to the Publications Effectivity Sheet on the ICP Website (www.api.org/ICP) for a list of specific editions, addenda, and supplements of the reference publications that are effective for your exam date.

Candidates are expected to demonstrate knowledge in the following categories:

Roles and Responsibilities

Candidates are expected to understand the different roles (ex. owner, inspector, contractor, etc.) related to refractory and their responsibilities. (*API 982, Section 4*).

Material Properties and Lining Designs

Candidates are expected to understand the different design and installation characteristics of refractory including the various application methods, categorizations of refractory, advantages, and disadvantages of each, and the various anchoring system design and techniques.

Service requirements and the critical properties of refractory systems should be understood, and a basic understanding of types of refractories that are used in various refinery equipment types should be known, for example, the common types of refractory specification that are used in each area of a fluid catalytic cracking unit (FCCU).

In-Service Inspection

Candidates are expected to demonstrate knowledge related to in-service inspection of refractory. They should be familiar with the different types of methods available to inspect refractory as well as their limitations. (*API 982, Section 6, Annex A*)

Methods may include:

- Visual
- Hammer test
- Mechanical tests
- Thermography/infrared
- Partial tear out
- Remote visual (limitations)
- Thickness verification
- Radiography

Candidates will be expected to calculate the remaining life of refractory. Calculations will be available in USC and SI. (*API 982, Section 6.3.1*)

Candidates are also expected to understand the types of defects, damages, degradation mechanisms (*API 982, Section 9*) that may impact refractory and the best method for detection.

Candidates are also responsible for understanding the Inspection and Test plan (*API 982, 8.4*) requirements, critical steps throughout the job, the responsible parties for each step, and documentation and reporting requirements. (*API 982, 8.2*)

Repair Methods and Quality Control

Candidates must understand how damaged and defective refractory should be repaired including installation methods and their advantages and disadvantages as well as anchoring and specification. Candidates must understand how to calculate a repair air. Calculations will be available in USC and SI. (*API 982, Section 7.2*)

Candidates must be familiar with critical quality control aspects of installation of various types of refractories, including:

- Casting
- Pneumatic Gunning
- Brick
- Fiber
- Anchors

Refractory Degradation

Candidates must be familiar with the different refractory degradation modes, and how each mode can affect the serviceability of the refractory, and how the degradation mode can be inspected and assessed. Some examples of degradation in castable refractory includes:

- Cracking
- Spalling
- Laminations
- Erosion
- Corrosion / Chemical Attack
- Coke Induced Failure Mechanisms
- Overheating
- Gas Bypassing/Flow Behind Refractory

Some examples of degradation in brick refractory includes:

- Creep
- Structural Movement
- Coke Impregnation
- Overheating

Some examples of degradation in anchor systems includes:

- Anchor failure
- Fatigue
- High temperature corrosion
- Mechanical failure
- Weld attachment failure

Failure modes of fiber, multi-layer refractory systems, and special components such as ferrules and tiles, shall also be understood.