BODY OF KNOWLEDGE

API-1169 PIPELINE CONSTRUCTION INSPECTOR

CERTIFICATION EXAMINATION

July 2014

API-1169 Pipeline Construction Inspectors must have a broad knowledge base relating to construction of new onshore pipelines. This knowledge base, at a minimum, includes such topics as inspector responsibilities, personnel and general pipeline safety, environmental and pollution control, and general pipeline construction inspection. The API-1169 Pipeline Construction Inspector Certification Examination is designed to determine if applicants have such knowledge.

Candidates will be given three hours to complete the 100-questions examination on a computer. Questions for the examination are multiple-choice and personal reference materials are not permitted to be brought into the computer testing centers. US-government based reference materials will be provided to all the candidates during the exam on their computer monitors.
To determine whether the applicants have sufficient knowledge of inspection practices and related topics, a minimum of one question from each main category listed within this Body of Knowledge will be included on the API certification examination. Only information covered in one of the referenced materials listed in this body of knowledge will be utilized for the examination questions.

REFERENCE PUBLICATIONS

API 1169, Basic Inspection Requirements – New Pipeline Construction
All of API 1169 is applicable to the examination

API 1104, Welding of Pipeline and Related Facilities
ATTN: Test questions will be based on the following portions of the document only:
Section 3, Terms, Definitions, Acronyms, and Abbreviations
Section 4, Specifications
Section 5, Qualifications of Welding Procedures with Filler Metal Additions
Section 6, Qualification of Welders
Section 7, Design and Preparation of a Joint for Production Welding
Section 8, Inspection and Testing of Production Welds
Section 9, Acceptance Standards for NDT
Section 10, Repair and Removal of Weld Defects
Section 11, Procedures for Nondestructive Testing (NDT)

API 1110, Pressure Testing of Steel Pipelines –
Entire document is subject to testing with exception of the appendices

API Q1, Specification for Quality Programs
ATTN: Test questions will be based on the following portions of the document only:

Section 3: Terms, Definitions and Abbreviations
Section 4: Quality Management System Requirements
Section 5: Product Realization

ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes
ATTN: Test questions will be based on the following portions of the document only:

Chapter 4: Protection of Personnel and the General Area
Chapter 5: Ventilation
Chapter 6: Fire Prevention and Protection
Chapter 8: Public Exhibitions and Demonstrations

ASME B31.4, Pipeline Transportation Systems for Liquids and Slurries
ATTN: Test questions will be based on the following portions of the document only:

Chapter I, Scope and Definitions
Chapter II, Design
Chapter III, Materials
Chapter V, Construction, Welding, and Assembly
Chapter VI, Inspection and Testing

ASME B31.8, Gas Transmission and Distribution Piping Systems
ATTN: Test questions will be based on the following portions of the document only:

General Provisions and Definitions
Chapter I, Materials and Equipment
Chapter II, Welding
Chapter III, Piping System Components and Fabrication Details
Chapter IV, Design, Installation and Testing

CGA (Common Ground Alliance) Best Practices

Entire document is subject to testing

INGAA, Construction Safety Guidelines

- *Natural Gas Pipeline Crossing Guidelines* (http://www.ingaa.org/File.aspx?id=20405)
  Section II - Definitions
- *CS-S-9 Pressure Testing (Hydrostatic/Pneumatic) Safety Guidelines*
  (http://www.ingaa.org/File.aspx?id=18981)
  Entire document is subject to testing

ISO 9000 Quality Management Systems – Fundamentals and Vocabulary

ATTN: Test questions will be based upon the Definitions Only

Pipeline Construction by Max Hosmanek, © The University of Texas Austin

Entire document is subject to testing

U.S. Federal Regulations

ATTN: The references below will be available to applicants on their computer monitors during the exam. Only those articles and sections specifically listed will be available to applicants.

29 CFR 1910, *Occupational Safety and Health Standards*

Subpart H – Hazardous Materials
Article 119
Subpart I – Personal Protective Equipment
The entirety of Subpart I (Excluding Subpart I Appendices)
Subpart J – General Environmental Controls
Articles 145-147 (Excluding Appendices)

29 CFR 1926, *Safety and Health Regulations for Construction*:

Subpart C- General Safety and Health Provisions
Articles 20-29 and Articles 32-35
Subpart D- Occupational Health and Environmental Controls
Article 62 (Excluding Appendices)
Subpart F – Fire Protection and Prevention
Article 152
Subpart H- Materials Handling, Storage, Use and Disposal
Articles 250 and 251
Subpart J – Welding and Cutting
Articles 351-354
Subpart L – Scaffolds
Article 451
Subpart M – Fall Protection
Articles 500-501
Subpart O- Motor Vehicles, Mechanized Equipment and Marine Operations
Article 600
Subpart P – Excavations
The entirety of Subpart P Including Appendices
Subpart U- Blasting and the Use of Explosives
Articles 900-902 & 914
Subpart CC – Cranes & Derricks in Construction
Article 1417

40 CFR 112, *Oil Pollution Prevention*

Subpart A – Applicability, Definitions and General Requirements for All Facilities and All Types of Oils

40 CFR 122, *EPA Administered Permit Programs: The National Pollutant Discharge Elimination System*

Subpart A – Definitions and General Program Requirements

49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*:

Subpart G – General Construction Requirements for Transmission Lines and Mains

Subpart J – Test Requirements

Subpart N – Qualifications of Pipeline Personnel

49 CFR 195, *Transportation of Hazardous Liquids by Pipeline*

Subpart D - Construction

Subpart E – Pressure Testing

Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities* 2012 (http://www.epa.gov/npdes/pubs/cgp2012_finalpermit.pdf)

Entire document is subject to testing

EXAMINATION CONTENT BASED ON SPECIFIC AREAS OF KNOWLEDGE AND PROFICIENCIES

The inspector should be knowledgeable of general inspection responsibilities, requirements, and expectations for pipeline construction that enable him/her to effectively carry out their duties.
The following is a list of specific topics that an applicant should be familiar with and expect to be tested during the API-1169 Pipeline Construction Inspection exam.

The following categories describe the minimum necessary knowledge and skills:

1. General Quality Principles

    a. Basic inspection principles, such as:
        - Management of Change
        - Personnel testing and qualification verification
        - Project requirements enforcement
        - Inspection roles and responsibilities
    b. Records management, including
        - Legibility
        - Traceability
        - Retrievability
        - Records Retention
    c. Document Control
        - Revision Status
    d. Non-Conformance handling
        - Control of nonconforming conditions
        - Reporting
        - Disposition
        - Corrective and Preventive Actions
        - Closing
    e. Root Cause Analysis (RCA)
        - Purpose of RCA
        - Defining root cause
    f. Calibration – Monitoring and Measurement Equipment Control
        - Equipment calibration status
        - Calibration methods
    g. Material Preservation and Handling
        - Quarantine, tagging, and identification
        - Standard requirements

2. Pipeline Construction Inspection

    a. Clearing and Grading
        - Alignment sheets (e.g., extra work space, PI locations, special conditions)
        - Specifications (e.g., width, right of way, grubbing, top soil segregation)
        - Permits (e.g., road crossing, road access, railroad, encroachment)
        - Special landowner requirements (e.g., line list)
        - Written and/or electronic reporting
    b. Ditching

- Base-bottom contour matching pipe
- Depth of cover specifications (e.g., CFR 49, part 192, part 195)
- Specifications (e.g., measurements)
- Landowner restrictions (e.g., ditch skip, cattle crossing, dust control)
- Monitoring and measuring devices
- Written and/or electronic reporting

c. Stringing
   - Materials identification (e.g., pipe grade, wall thickness, coating, heat and pipe number)
   - Materials defects / condition
   - Handling requirements (e.g., lifting, loading and unloading, equipment, stacking, securing)
   - Pipe tally / pipe placement (e.g., placed per alignment drawings, seam locations)
   - Specifications (e.g., minimum equipment requirements)
   - Written electronic reporting (e.g., stringing distances and skips, number of joints)

d. Pipe Bending
   - Pipe ovality and wrinkles (e.g., ASME B.31.4, B.31.8, CFR192)
   - Proper bending equipment (e.g., liners, mandrels, shoes, angle measurement)
   - Specifications (e.g., bending requirements, tangents, maximum angles, seam alignments, coating or metal damage)
   - Written electronic reporting (e.g., bend location, as built)

e. Coating Basics
   - Specifications, qualified procedures, qualified personnel, documentation, material/consumable control, testing (equipment and products)

f. Welding Basics
   - Specifications, qualified procedures, qualified personnel, documentation, material/consumable control, testing (equipment and products)

g. Lowering In
   - Proper equipment (e.g., lifting, cradles, slings)
   - Specifications (e.g., spacing, location in ditch, depth, ditch preparation, sand bag placement, benching)
   - Lifting plans (e.g., boom spacing, lift height, boom size, number of booms)
   - Written / electronic Reporting (e.g., amount, damage, holiday detection)

h. Backfill
   - Proper equipment (e.g., type, padding requirements, rock shield, erosion control, weights)
   - Padding pipe (e.g., depth, material size, compaction, foam)
   - Specifications (e.g., padding amount, material size, bench spacing, compaction, crown)
   - Written / electronic reporting (e.g., quantity and location)
   - Buoyancy control (e.g., types, installation, spacing, documentation)

i. Tie-in's
   - Specifications (e.g., alignment, OQ)
   - Written / electronic reporting (e.g., location, amount)
   - Material identification (e.g., pipe number, heat number, cutoff length)
   - Material Placement (e.g., transition, pipe support)

j. Pressure Testing
   - Specifications (e.g., pipeline elevation/profile, pressure range, time, temperature correction)

- DOT requirements (e.g., CFR192, CFR195)
- Pressure testing equipment (e.g., type and size, test heads, pipe/hose)
- Calibration certification of pressure testing equipment
- Notifications (e.g., first responder, regulators)
- Uptake (e.g., source requirements, withdraw rate, filtration)
- Dewatering (e.g., special requirements, pigging, filtration and testing)
- Pipeline cleaning/drying requirements (e.g., dew point calibration)
- Written / electronic reporting (e.g., charts, records, calibration, pressure test logs, test distance)
- Leak identification and repairs

k. Cathodic Protection
- Alignment sheets (e.g., location, type, length)
- Specifications (e.g., connection, wire size, anode ground beds, size, length, location)
- Written / electronic reporting (e.g., location, amount, as builts, type)

l. Clean-Up
- Alignment sheets (e.g., special conditions, mile marker placement, re-vegetation, bank stabilization)
- Landowner requirements (e.g., damages, special conditions, fences, restoration)
- Equipment (e.g., LGP, decompaction, seeding)

m. As-Builts
- Redline drawings, alignment sheets showing final as built conditions, dimensions, and characteristics of the pipeline (e.g., weld maps/logs, NDE maps/logs, PI/POT locations, depth of cover, test leads, material and coating information)

n. HDD Basics
- Horizontal drilling process, drilling fluids, drill path/profile, geotechnical studies, pull force, radius of curvature, entry/exit points, entry/exit angles)
- Testing, gauge plate inspections, deformation

o. Bores, road crossing, foreign utility crossings
- Specifications, clearances, type of bores, voids, crossing agreements/permits, cased vs. uncased crossings, pipe condition

3. <u>Pipeline Construction Safety</u>

a. Overall/Basic Safety
- OSHA regulation 1910
- Permit definitions (e.g., hot work, excavation, confined space, safe work)
- Rigging protocol (e.g., lifting devices)
- Job Safety Analysis (JSA) (e.g., purpose, hazards)
- Hazard recognition (e.g., changing conditions)
- SDS (MSDS) - Location, basic features
- HAZCOM (types of hazards such as fire, toxicity, corrosion, explosive; hazardous materials such as fuels, paints, NORMS, inhibitors)
- Site Conditions (e.g., terrain, environmental, temperature extremes)
- Emergency response protocol (e.g., first responder contacts)
- Stop work authority (e.g., immediate danger life, health, environment)
- OQ requirements per 192, 195
- Security protocol
- PPE (e.g., hearing, foot, hand, head, eye, breathing, fire)
- Specialized inspectors (e.g., coating, welding, excavation competent person)
- LOTO protocol (OSHA)

- Reporting protocol (e.g., dirt report, incident/near miss)
- Hot line tie-ins
- Appropriate use, storage and inspection of tools, equipment and materials

b. Confined Space
   - Confined space definitions (e.g., back welding, inside pipes)
   - Entry permits
   - Required personnel
   - Entry log
   - Fire watch requirements
   - Respiratory requirements (e.g., types of respirators)
   - Rescue requirements and equipment
   - Gas detectors
   - Air monitoring
   - Venation requirements
   - Toxic atmosphere (e.g., PEL, IDLH)

c. Elevated Work Surface
   - Fall arrest/protection
   - Ladder safety
   - Toe board
   - Hand rails
   - Scaffold erection and tagging

d. Excavation
   - CGA / foreign line excavation (e.g., locating requirements, line sweep, uniform color code, daylighting requirements, third party representation)
   - INGAA Crossing Guidelines
   - Safe digging practices (e.g., potholing, safe approach limits, operator qualifications)
   - Spoil pile placement
   - Soil classification (e.g., sloping, benching, type)
   - Shoring (e.g., trench box, sheet pile)
   - Access and egress for excavation and confined space
   - One call
   - Electrical hazards (e.g., underground, induced currents, overhead)
   - Excavation barriers (e.g., snow fencing, radiography, road crossing covers, exclusion)
   - Traffic control (e.g., signs, flagmen, lighting)
   - Atmospheric testing requirements (e.g., oxygen levels, safety levels)

e. Pressure Testing
   - Minimum distance from test (e.g., personnel, public, structures, limited access)
   - Hazards associated with rupture
   - Test equipment failure
   - Notification (e.g., public safety, first responder, nonessential personnel)
   - Pressurizing and depressurizing
   - Running drying pigs (use)

f. Welding
   - Arc flashes, working in area of grinding, fire hazards, propane hazards, moving equipment

g. Coating
   - Flammable materials, respiratory concerns (fumes, dust)

h. NDE
   - Radiation hazards

4. Pipeline Construction Environmental Protection
    - Environmental protection plan - project specific drawings, specs (e.g., local, county, state, federal, landowner; land disturbance, fueling area, spill kits, emergency response, pollution prevention and control)
    - Water intake, use and discharge requirements (e.g., hydrostatic test water, dust control)
    - Waste handling (e.g., asbestos, impacted soil, sand blast, drilling fluids)
    - Erosion controls (e.g., silt fencing)
    - Soil handling / ROW (e.g., top soil segregation, multi lift handling)
    - Documentation requirements (e.g., reading drawings, filling out forms, reviewing permits)
    - Environmental hazards (e.g., contaminated soil, NORM)
    - Groundwater handling (e.g., filters, hay bales, well points, dewatering)
    - Stormwater handling
    - Notification requirements (e.g., spill, incident, landowner interaction, agency interaction, notification protocols)
    - Upland and wetland requirements (e.g., delineation, identification)
    - HDD (e.g., frac out, drilling mud, containment and disposal)
    - Bank stabilization techniques