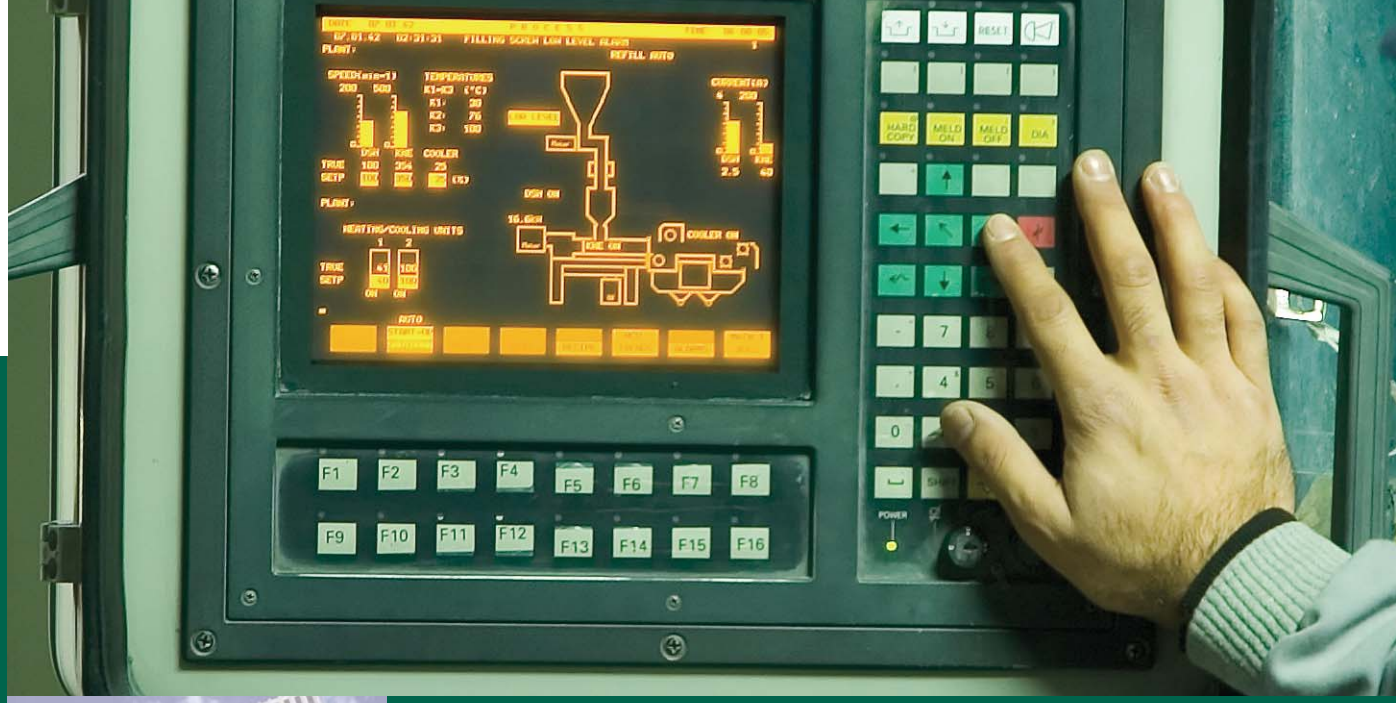
ASQ
AMERICAN SOCIETY FOR QUALITY™

CERTIFIED QUALITY INSPECTOR



Certified Quality Inspector

Quality excellence to enhance your career and boost your organization's bottom line

Certification from ASQ is considered a mark of quality excellence in many industries. It helps you advance your career, and boosts your organization's bottom line through your mastery of quality skills. Becoming certified as a Quality Inspector confirms your commitment to quality and the positive impact it will have on your organization.

Certified Quality Inspector Information

The Certified Quality Inspector is an inspector who, in support of and under the direction of quality engineers, supervisors, or technicians, can use the proven techniques included in the Body of Knowledge. Under professional direction, the quality inspector evaluates hardware documentation, performs laboratory procedures, inspects products, measures process performance, records data, and prepares formal reports.

Proof of Professionalism

Proof of professionalism may be demonstrated in one of three ways:

- Membership in ASQ, an international affiliate society of ASQ, or another society that is a member of the American Association of Engineering Societies or the Accreditation Board for Engineering and Technology.
- Registration as a Professional Engineer.
- The signatures of two persons—ASQ members, members of an international affiliate society, or members of another recognized professional society—verifying that you are a qualified practitioner of the quality sciences.

Examination

Each certification candidate is required to pass a written examination which consists of multiple choice questions that measure comprehension of the Body of Knowledge. The Quality Inspector examination is a four-hour, 100-question examination. It is offered in English.

Minimum Expectations of a Certified Quality Inspector

- Must understand types of measurement, measurement terminology, and the different types of measurement scales.
- Must have a strong knowledge of basic mathematical operations and perform measurement conversions; be able to solve for x; add and subtract degrees, minutes, and seconds.
- Must know the difference between accuracy and precision and be able to select the appropriate measuring tools and techniques.
- Must know how to measure using surface plate layouts.
- Must have basic calibration knowledge.
- Must be able to identify/recognize inspection errors and initiate resolution.
- Must be able to read and interpret blueprints and know definitions of critical, major, and minor characteristics.
- Must have a general knowledge of ASME Y14.5M, working knowledge of GD&T, and must understand the x, y, z coordinate system.
- Must be able to use inspection planning tools and perform a product audit; determine sample size for lots; pull random samples.
- Must have knowledge of testing methods.
- Must be able to identify and report nonconforming material.
- Must understand traceability (product, material, and calibration).
- Must know basic quality terms, definitions, and concepts.

- Must know the definition of PDCA and understand the team concept.
- Must know basic statistical terms and techniques, how to plot data, and how to recognize out-of-control conditions.

Education and/or Experience

To apply for certification as a Quality Inspector, you must have:

- Two years of on-the-job experience in quality inspection or a related field.
- If you do not have a high-school diploma or GED, you must have an additional three years of work experience.

For comprehensive exam information on Quality Inspector certification, visit **www.asq.org/certification**.

Body of Knowledge

Certified Quality Inspector

The topics in this Body of Knowledge (BOK) include additional detail in the form of subtext explanations and the cognitive level at which the questions will be written. This information will provide useful guidance for both the Exam Development Committee and the candidate preparing to take the exam. The subtext is not intended to limit the subject matter or be all-inclusive of what might be covered in an exam. It is meant to clarify the type of content to be included in the exam. The descriptor in parentheses at the end of each entry refers to the maximum cognitive level at which the topic will be tested. A complete description of cognitive levels is provided at the end of this document.

I Technical Mathematics (16 Questions)

A. Basic Shop Math
Solve basic shop problems using addition, subtraction, multiplication, division, fractions, decimals, squares, and square roots. Use various methods to obtain significant digits for positive and negative numbers, including truncating, rounding up, and rounding down. (Application)

B. Basic Algebra
Solve or simplify first-degree and single-variable equations. (Application)

C. Basic Geometry
Calculate general parameters such as area, circumference, perimeter, and volume for basic geometric shapes, and calculate complementary and supplementary angles. (Application)

D. Basic Trigonometry
Compute angles and lengths using such trigonometric functions as sine, cosine, tangent, and the Pythagorean theorem. (Application)

E. Measurement Systems
Convert like-units between SI, English, and metric measurement systems (e.g., inch-micro-inch, liter-quart, meter-millimeter). (Application)

F. Measurement Conversions
Use various numbering methods such as scientific notation, decimals, and fractions, and convert values between these methods. (Application)

II Metrology (30 Questions)

A. Common Gages and Measurement Instruments

1. **Variable gages**
   Identify and use variable gages, including micrometers, calipers, thread wires, pitch micrometers, linear scales, etc. (Application)
2. **Attribute gages**
   Identify and use attribute gages, including snap, plug, and thread gages, gage blocks, pins, etc. (Application)
3. **Transfer gages**
   Identify and use transfer gages, including small-hole gages, radius gages, spring calipers, etc. (Application)
4. **Measurement scales**
   Describe and distinguish between dial, digital, and vernier scales. (Comprehension)

B. Special Gages and Applications

1. **Electronic gaging**
   Identify and describe basic tools used with electronics such as oscilloscope, multimeter, pyrometer, etc. (Comprehension)
2. **Automatic gaging**
   Identify and describe basic components of automatic gaging, such as machine vision, ultrasonic, X-ray, laser, etc. (Comprehension)
   [Note: The use of these components is covered under 111.D.1.]
3. **Pneumatic gaging**
   Identify and describe basic components of pneumatic gaging, including air columns, probes, rings, etc. (Comprehension)

C. Gage Selection, Handling, and Use

1. **Factors in gage selection**
   Select gages according to the feature or characteristic to be measured, the applicable tolerance, the 10:1 rule, etc.; the accuracy, resolution, and capability of the test instrument, and determine whether the type of measurement should be direct, differential, or transfer. (Application)
2. **Gage handling, preservation, and storage**
   Identify and apply various methods of cleaning, handling, and storing gages. (Application)
3. **Gage correlation**
   Identify and apply methods for establishing the correlation between measurement instruments, such as gage-to-gage or manual-to-automated process. (Application)

D. Surface Plate Tools and Techniques

1. **Surface plate equipment**
   Select and use height gages, V-blocks, indicators, etc., to measure various types of products. (Application)
2. **Angle measurement instruments**
   Identify and use tools such as protractors, sine bars, angle blocks, etc., in various situations. (Application)

E. Specialized Inspection Equipment

1. **Weights, balances, and scales**
   Define and describe how to use these types of tools. (Application)
2. **Measuring finish**
   Describe and apply profilometers, profile tracers, fingernail comparators, etc. (Application)
3. **Measuring shape and profile**
   Describe and apply various types of comparators, roundness testers, precision spindles, etc. (Application)
4. **Optical equipment**
   Describe and apply optical comparators, optical flats, microscopes, reference specimens, etc. (Application)
5. **Digital vision systems**
   Define and describe how digital cameras, online surface inspection, and other digital systems are used in quality inspection. (Comprehension)
6. **Coordinate measuring machine (CMM)**
   Explain the basic operation of a CMM, including use of the x, y, and z axes, and the limitations of locating functional datums, target points, and target areas. (Application)

F. Calibration

1. **Calibration systems**
   Describe the principles of calibration, including its basic purpose, methods of establishing and monitoring calibration intervals, records, coding schemes, etc. (Application)
2. **Calibration standards**
   Describe the hierarchy of standards, from working standards through international standards. (Comprehension)
3. **Equipment traceability**
   Describe the requirements for documenting traceability to standards. (Comprehension)
4. **Gage calibration environment**
   Describe the effects that environmental conditions, such as temperature, humidity, vibration, the cleanliness of the gage, etc., can have on the calibration process. (Application)
5. **Out-of-calibration effects**
   Describe the effects that out-of-calibration instruments can have on product acceptance and the actions to take in response to this situation. (Application)

G. Measurement System Analysis
Define and describe various elements, including identifying and measuring bias, stability, accuracy, linearity, etc., and reviewing repeatability and reproducibility (R&R) studies. (Comprehension)

III Inspection and Test (30 Questions)

A. Geometric Dimensioning and Tolerancing (GD&T)

1. **Blueprints and engineering drawings**
   Define and interpret various sections of technical drawings, including title, tolerance, and revision blocks, notes, scale, etc. (Application)
2. **Terminology and symbols**
   Define and interpret drawing views, details, etc., for product specifications or other controlling documents, and define and use various terms and symbols from the ASME Y14.5M Standard. (Application)

3. **Position and bonus tolerances**
   Calculate these from various drawings. (Analysis)
4. **Part alignment and datum structure**
   Determine part alignment and setup using the datum structure. (Analysis)

B. Sampling
Define and interpret terms such as acceptable quality level (AQL), random sampling, lot size, acceptance number, sampling plans, inspection type, timeliness, etc. (Application)

C. Inspection Planning and Procedures
1. **Inspection planning**
   Define and distinguish between inspection types such as incoming material, first article (first piece), in-process, final, etc., and identify in what order they should be applied. (Application)
2. **Inspection errors**
   Identify potential inspection errors such as bias, fatigue, flinching, distraction, etc. (Application)
3. **Product traceability**
   Identify methods to trace products and materials such as age control, shelf life, and first-in first-out (FIFO). (Application)
4. **Identification of nonconforming material**
   Describe various methods of identifying nonconforming material such as tagging, labeling, and segregating. (Application)
5. **Levels of severity**
   Determine levels of severity, such as critical, major, and minor classification of product features and defects. (Application)
6. **Reporting of nonconforming material**
   Describe the reporting of nonconforming material for disposition, such as material review board (MRB), rework, reprocess, scrap, and customer waiver. (Application)

D. Testing Methods
1. **Nondestructive testing**
   Define methods such as X-ray, eddy current, ultrasonic, dye penetrant, and magnetic particle. (Knowledge)
2. **Destructive testing**
   Define methods such as tensile, force testing, and leak testing. (Knowledge)
3. **Functionality testing**
   Define methods such as tension, torque, and compression. (Knowledge)
4. **Hardness testing**
   Classify and apply methods such as Brinell, Rockwell, Durometer, and micro-hardness test. (Application)
5. **Verification of software for test equipment**
   Identify and define basic steps to ensure that the software for test equipment adequately and correctly performs its intended functions by safeguarding, functional checks, comparison of test results, and identification of attributes and parameters. (Knowledge)

IV Quality Assurance (24 Questions)

A. Basic Statistics and Applications
1. **Measures of central tendency**
   Calculate mean, median, and mode. (Application)
2. **Measures of dispersion**
   Calculate range, standard deviation, and variance. (Application)
3. **Measures of proportion or percentage**
   Calculate these measures for various data sets. (Application)
4. **Graphical displays**
   Define, interpret, and distinguish between graphical displays, such as histograms, scatter diagrams, tally sheets, bar charts, etc., and apply them in various situations. (Application)
5. **Normal distribution**
   Define the characteristics of a normal distribution, such as symmetry, bell curve, central tendency, etc. (Comprehension)

B. Statistical Process Control (SPC)
1. **Common and special causes**
   Explain the difference between these causes of variation. Determine whether a process is in or out of statistical control by analyzing data patterns (runs, trends, hugging, etc.), and identify what actions should be taken in response. (Evaluation)
2. **Control limits vs. specification limit**
   Define, describe, and distinguish between these types of limits. (Application)
3. **Variables charts**
   Identify characteristics and uses of $\bar{X}$ – R and $\bar{X}$ – s charts. (Application)
4. **Attributes charts**
   Identify characteristics and uses of p, np, c, and u charts. (Application)
5. **Process capability analysis**
   Define and distinguish between Cp, Cpk, Pp, and Ppk, and apply them to various data sets. (Application)

C. Quality Improvement
1. **Terms and concepts**
   Define basic quality improvement concepts such as prevention versus detection, the importance of customer satisfaction, the cost of poor quality, total quality management (TQM), etc. (Comprehension)
2. **Products vs. processes**
   Define and distinguish between products and processes. Describe the interrelationships of product design, materials used, manufacturing processes, and final output. Describe how individual steps in a process can affect the final product or the system as a whole. (Comprehension)
3. **Quality audits**
   Define and describe various types of audits, including internal, external, system, product, process, etc., and describe how corrective action requests (CARs) from audits can support quality improvement. (Comprehension)

D. Quality Tools and Techniques
Define and use various problem-solving and continuous improvement tools, including the seven quality control tools, plan-do-check-act (PDCA)/ plan-do-study-act (PDSA), Six Sigma DMAIC, root-cause analysis, etc. (Application)

E. Resources
1. **Environmental and safety**
   Define supports such as material safety data sheet (MSDS), personal protective equipment (PPE), etc. (Knowledge)
2. **Reference documents**
   Identify and apply reference materials and documents such as ISO, ANSI, ASTM, and QS standards, and customer requirements as the authority for certain procedures or actions. (Application)
3. **Technical reports**
   Read, interpret, and generate technical reports to diagnose problems and communicate solutions. (Analysis)
4. **Employees as resources**
   Define and describe related concepts, including empowering employees, involving them on projects or improvement teams, etc. Define team roles and responsibilities (facilitator, ground rules, etc.), and describe the four stages of team development: forming, storming, norming, performing. (Comprehension)

Math Note: Approximately 20% of the questions in each CQI exam will require calculation.

Six Levels of Cognition

Based on Bloom's Taxonomy (1956)

In addition to the content specifics, the subtext detail also indicated the intended complexity level of the test questions for that topic. These levels are based on the "Levels of Cognition" (from *Bloom's Taxonomy*, 1956) and are presented below in rank order, from least complex to most complex.

Knowledge Level (Also commonly referred to as recognition, recall, or rote knowledge.) Be able to remember or recognize terminology, definitions, facts, ideas, materials, patterns, sequences, methodologies, principles, etc.

Comprehension Level Be able to read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

Application Level Be able to apply ideas, procedures, methods, formulas, principles, theories, etc., in job-related situations.

Analysis Be able to break down information into its constituent parts and recognize the parts' relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

Synthesis Be able to put parts or elements together in such a way as to show a pattern or structure not clearly there before; identify which data or information from a complex set are appropriate to examine further or from which supported conclusions can be drawn.

Evaluation Be able to make judgments regarding the value of proposed ideas, solutions, methodologies, etc., by using appropriate criteria or standards to estimate accuracy, effectiveness, economic benefits, etc.

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