Certified Quality Inspector (CQI) BOK Map 2012 – 2003

The Certified Quality Inspector Body of Knowledge (BOK) has been updated to ensure that the most current state of practice is being tested in the examination. If you would like more information about how a BOK is updated, you can read a description of the process on page 4 of the Certification Handbook (PDF – 228 KB) on the www.asq.org website.

Part of the updating process includes conducting a job analysis survey to determine whether the topics in the previous BOK are still relevant to the current job role and to identify any new topics that have emerged since that previous BOK was developed. The results of the Certified Quality Inspector job analysis survey showed that most of the topics that were in the 2003 BOK are still relevant to the job roles of Certified Quality Inspectors. All of the topics that were in the previous BOK met the survey validation threshold to be included in the new BOK. The tables below show the key changes between the two BOKs.

The biggest changes in the new BOK occurred in area IV: Quality Audits moved from IVC3 to become its own topic as IVD with 5 subtopics. Quality Tools and Techniques was split into two topics: IVE now specifies the 7 classic quality tools as subtopics, and IVF covers Problem-solving Tools and Continuous Improvement Techniques in 4 subtopics. The topic on "Resources" is now IVG. All details of these changes are provided in the BOK Map Table that follows. In addition, a style change is being instituted for the term 'gage': the new BOK will use the more contemporary spelling of 'gauge,' except for the term "gage blocks," since companies that manufacture those tools continue to use the spelling 'gage.'

The 2012 Certified Quality Inspector Body of Knowledge (CQI BOK) will be introduced at the March 3, 2012, administration. Both BOKs will be available online until the application deadline for the March 2012 administration, at which time the 2003 BOK will be removed.

General comments about ASQ Body of Knowledge updates

When the Body of Knowledge (BOK) is updated for an ASQ exam, the majority of the material covered in the BOK remains the same. There are very few programs that change dramatically over a 5-year period. One of the points that we make to all of the exam development committees is that ASQ Certification Exams need to reflect "the state of practice," not "the state of the art." This helps to keep the programs grounded in what people currently do, rather than being driven by the latest hot-topic improvement idea or trend. Typically, the biggest change in any updated BOK is in how the content is organized. When a new BOK is announced and posted on the ASQ website, we also include a "BOK Map" that highlights the changes between the two bodies of knowledge: old and new. The BOK map clearly identifies any new content that has been added to the exam, as well as any content that has been removed from the exam.

With regard to exam preparation materials, you should be able to use any of the reference books that are currently listed on the bibliography for the exam program. See CQI References on the www.asq.org website. These are the source materials that the exam development committee uses to write questions and verify answers.

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
I	**I. TECHNICAL MATHEMATICS (20 Questions)**	**+ 4 questions (was 16)**
1A **See page 1**	**A. Basic Shop Math** Solve basic shop math problems using addition, subtraction, multiplication, division of fractions and decimals, squares and square roots. Use methods such as truncating and rounding to obtain significant digits for positive and negative numbers. (Apply)	
1B	**B. Basic Algebra** Solve or simplify first-degree and single-variable equations. (Apply)	
1C	**C. Basic Geometry** Calculate general parameters such as area, circumference, perimeter, and volume for basic geometric shapes. Calculate complementary and supplementary angles. (Apply)	
1D	**D. Basic Trigonometry** Compute angles and lengths using trigonometric functions such as sine, cosine, tangent, and the Pythagorean Theorem. (Apply)	
1E	**E. Measurement Systems** Convert units within and between English and metric measurement systems (SI) such as inch to micro-inch, liter to quart, meter to millimeter, etc. (Apply)	
1F Measurement Conversions	**F. Numeric Conversions** Use various numbering methods such as scientific notation, decimals, and fractions, and convert values between these systems. (Apply)	Title change
II	**II. METROLOGY (30 Questions)**	**Same number of questions**

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
2A	**A. Common Gauges and Measurement Instruments** **1) Variable gauges** Identify and use variable gauges, including micrometers, calipers, dial indicator, CMM, linear scales, etc. (Apply) **2) Attribute gauges** Identify and use attribute gauges, including thread plug, progressive ring, flush pin, radius gauge, etc. (Apply) **3) Transfer gauges** Identify and use transfer gauges, including small-hole gauges, spring calipers, etc. (Apply) **4) Measurement scales** Describe and distinguish between dial, digital, and vernier scales. (Remember)	
2B	**B. Special Gauges and Applications** Identify and describe the following basic tools and components. (Remember) **1) Electronic gauging tools: oscilloscopes, multimeters, pyrometers, etc.** **2) Automatic gauging components: machine vision, ultrasonic, X-ray, laser, etc.** **3) Pneumatic gauging components: air columns, probes, rings, etc.**	
2C	**C. Gauge Selection, Handling, and Use** **1) Gauge selection** Select gauges according to the feature or characteristic to be measured, the applicable tolerance and the accuracy, and the resolution and capability of the test instrument. Determine whether the type of measurement should be direct, differential, or transfer. (Apply) **2) Gauge handling, preservation, and storage** Identify and apply various methods of cleaning, handling, and storing gauges. (Apply) **3) Gauge correlation** Identify and apply methods for establishing the correlation between measurement instruments such as gauge-to-gauge or manual-to-automated process. (Apply)	
2D	**D. Surface Plate Tools and Techniques** **1) Surface plate equipment** Select and use height gauges, V-blocks, indicators, etc., to measure various types of features. (Apply) **2) Angle measurement instruments** Identify and use protractors, sine bars, angle blocks, etc. (Apply)	

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
2E	**E. Specialized Inspection Equipment** **1) Measuring mass** Describe and apply weights, balances, and scales. (Apply) **2) Measuring finish** Describe and apply profilometers, fingernail comparators, etc. (Apply) **3) Measuring shape and profile** Describe and apply mechanical comparators, roundness testers, precision spindles, profile tracers, etc. (Apply) **4) Optical equipment** Describe and apply optical comparators, optical flats, microscopes, etc. (Apply) **5) Digital vision systems** Define and describe the use of digital cameras, in-line optical sensors, and other digital systems for product inspection. (Remember) **6) Coordinate measuring machine** Describe the advantages and disadvantages of the CMM and the basic operation of the x, y, and z axes. Describe its limitations with regard to locating functional datums, target points and areas, and hole positions. (Understand)	
2F	**F. Calibration** **1) Calibration systems** Describe the principles and purpose of a calibration system, including the importance of establishing calibration intervals. Identify and use basic tracking and identification codes, etc., to control calibration equipment. (Apply) **2) Calibration standards** Describe the hierarchy of standards, from working standards through international standards. (Remember) **3) Equipment traceability** Describe the requirements for documenting traceability to standards. (Remember) **4) Gage calibration environment** Describe the effects that environmental conditions such as temperature, humidity, vibration, and cleanliness of the gauge, etc., can have on calibration. (Apply) **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. (Apply)	

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
2G	**G. Measurement System Analysis (MSA)** Define and describe the following elements of MSA. (Remember) **1) Bias** **2) Stability** **3) Accuracy** **4) Linearity** **5) Repeatability and reproducibility (R & R) studies**	
III	**III. INSPECTION AND TEST (30 Questions)**	**Same number of questions**
3A	**A. Blueprints, Drawings, Geometric Dimensioning & Tolerancing (GD&T)** **1) Blueprints and engineering drawings** Define and interpret various sections of technical drawings: title block, tolerances, change or revision blocks including notes scale, and size details, etc. (Apply) **2) Terminology and symbols** Define and interpret drawing views and details for product specifications or other controlling documents. Define and use various terms and symbols from the ASME Y14.5M Standard, (Analyze) **3) Position and bonus tolerances** Calculate position and bonus tolerances from **various drawings (Analyze)** **4) Part alignment and datum structure** Determine part alignment and setup using the datum structure. (Analyze)	Topic title expanded
3B	**B. Sampling** Define and interpret the following terms related to sampling. (Apply) **1) Acceptance quality limit (AQL)** **2) Random sampling** **3) Lot and sample size** **4) Acceptance number** **5) Sampling plans**	
3C Inspection Planning and Procedures	**C. Inspection Planning and Processes** **1) Inspection types** Define and distinguish between inspection types ,such as incoming material, first article (first-piece), in process, final, etc. (Apply) **2) Inspection errors** Identify potential inspection errors such as bias, fatigue, flinching, distraction, etc. (Apply) **3) Product traceability** Identify methods to trace products and materials, such as age control, shelf life, and first-in-first-out	Topic title changed

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
	(FIFO).(Apply) **4) Identification of non-conforming material** Describe various methods of identifying nonconforming material, such as tagging, labeling, and segregating. (Apply) **5) Levels of severity** Define and describe levels of severity (critical, major, minor, etc.) and apply them to product features and defects. (Apply) **6) Disposition of nonconforming material** Describe disposition methods, including rework, reprocess, scrap, customer waiver, etc., as determined by a material review board (MRB) or other authority. (Apply)	
3D	**D. Testing methods** Define and use the following methods in various situations. (Apply) **1) Nondestructive testing: X-ray, eddy current, ultrasonic, dye penetrant, magnetic particle, etc.** **2) Destructive testing: tensile, force testing, drop test, etc.** **3) Functionality testing: tension, torque, leak testing and compression, etc.** **4) Hardness testing: Brinell, Rockwell, Durometer, and micro-hardness scales**	Separated Software for Test Equipment to 3E
3D5	**E. Software for test equipment** Identify and describe basic tools (e.g., safeguarding, functional checks, comparison of test results, identification of attributes and parameters) used to ensure that the software for test equipment adequately and correctly performs its intended functions. (Remember)	

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
IV	**IV. QUALITY ASSURANCE (20 Questions)**	**- 4 Questions (was 24)**
4A	**A. Basic Statistics and Applications** **1) Measures of central tendency** Calculate mean, median, and mode. (Apply) **2) Measures of dispersion** Calculate range, standard deviation, and variance. (Apply) **3) Measures of proportion** Calculate percentage and ratio measures for various data sets. (Apply) **4) Graphical displays** Define, interpret, and use scatter diagrams, tally sheets, bar charts, etc., to display data effectively in various situations. (Apply) **5) Normal distribution** Define various characteristics of normal distribution: symmetry, bell curve, central tendency, etc. (Understand)	
4B	**B. Statistical Process Control (SPC)** **1) Common and special cause variation** Explain the difference between these causes of variation. Determine whether a process is in statistical control by analyzing data patterns (runs, trends, hugging, etc.), and identify what actions should be taken in response. (Evaluate) **2) Control limits and specification limits** Define, describe, and distinguish between these limits as used in SPC. (Apply) **3) Variables charts** Identify characteristics and uses of $\overline{X} - R$ and $\overline{X} - s$ charts. (Apply) **4) Attributes charts** Identify characteristics and uses of p, np, c, and u charts. (Apply) **5) Process capability analysis** Define and distinguish between C_p, C_{pk}, P_p, and P_{pk} studies and identify their application to various types of data. (Understand)	

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
4C	**C. Quality Improvement** **1) Terms and concepts** Define basic quality improvement concepts such as defect detection and prevention, the cost of poor quality, total quality management (TQM) the importance of customer satisfaction, etc. (Understand) **2) Products and processes** Define and distinguish between products and processes. Describe the interrelationships of product design, materials used, manufacturing processes, and final output, and how individual steps in a process can effect the final product or the system as a whole. (Understand)	Separated Quality Audits to 4D
4C3	**D. Quality Audits** **1) Types of audits** Define and describe types of audits, including internal, external, system, product, and process, etc. (Understand) **2) Audit process** Define and describe various stages of the audit process (planning, performance, and closure), including audit scope and purpose, resources needed, audit schedule, opening meeting, interviewing, data gathering, document and record review, analysis of results, closing meeting, audit documentation and recordkeeping, verification of corrective actions, etc. (Understand) **3) Audit tools** Define and describe the purpose of checklists, log sheets, sampling plans, record and document reviews and forward- and backward-tracing. (Understand) **4) Communication tools and techniques** Define and describe the use of graphs, charts, diagrams, and other aids for written and oral presentations, including interview techniques and listening skills. (Understand) **5) Corrective action requests (CARs)** Describe how CARs from audits can support quality improvement. (Understand)	Now includes subtopics
4D 1-7	**E. Quality Tools and Techniques** Define and use the following quality tools and techniques. (Apply) **1) Pareto charts** **2) Cause and effect diagrams** **3) Flowcharts** **4) Control charts** **5) Check sheets** **6) Scatter diagrams** **7) Histograms**	Separated classic quality tools from problem-solving tools (now 4F)

2003 BOK	2012 BOK Details	New Elements in 2012 BOK
4D 8-11	**F. Problem-solving Tools and Continuous Improvement Techniques** Describe and use the following tools and techniques in various situations. (Apply) **1) Plan-do-check-act (PDCA) or Plan-do-study-act (PDSA) cycles** **2) Lean tools for eliminating waste: 5S, error-proofing, value-stream mapping, and lean concepts: kaizen, flow, pull.** **3) Six Sigma phases: define, measure, analyze, improve, control (DMAIC)** **4) Failure mode and effects analysis (FMEA)**	New title
4E	**G. Resources** **1) Environmental and safety support** Define and use various resources related to personal and environmental safety: material safety data sheet (MSDS), personal protective equipment (PPE), etc., (Apply) **2) Reference documents** Identify and use national and international standards (e.g., ISO, ANSI, ASTM, QS) and customer requirements as authorities that support processes and procedures used to assure quality products. (Apply) **3) Technical reports** Review, analyze, and interpret technical reports that are used to diagnose problems and communicate solutions. (Analyze) **4) Employees as resources** – Describe how employees can be empowered and the value they add to project teams or quality improvement teams – Describe typical team roles and responsibilities: facilitator, ground rules, project or team charter – Describe the four stages of team development: forming, storming, norming, performing	