

## CQT BOK Map 2003 – 2012

The Certified Quality Technician (CQT) 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 on how a BOK is updated, see a description of the process on page 4 in the [Certification Handbook](#) (PDF – 228 KB) on the [www.asq.org](http://www.asq.org) website.

Part of the updating process is to conduct a job analysis survey to determine whether the topics in the 2003 BOK are still relevant to the job role of quality technicians and to identify any new topics that have emerged since that BOK was developed. The results of the CQT job analysis survey showed that most of the topics that were in the 2003 BOK are still relevant to the job roles of quality technicians in 2011. Several topics did not meet the survey validation threshold to be included in the new BOK and they are indicated in the following tables. A few new topics were added to the 2011 BOK, and they are highlighted on the following pages as well. 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 Technician Body of Knowledge (CQT BOK) will be introduced at the March 3, 2012, administration. Both BOKs will be available online until March 2012, 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 also 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. These are the source materials that the exam development committees use to write questions and verify answers.

**CQT BOK Map 2003 – 2012**

| 2003 BOK  | 2011 BOK Details  | New Elements in 2012 BOK   |
|---|---|--|
| <b>I. Quality Concepts and Tools (22 Questions)</b> |   | <b><u>Increased</u> by 2 questions</b>   |
| 1A1   | <b>A. Quality Concepts</b><br>1. Customers and suppliers<br>Define internal and external customers, identify their expectations, and determine their satisfaction levels; define internal and external suppliers and key elements of relations with them. (Understand)            |  |
| 1A2   | 2. Quality principles for products and processes<br>Identify basic quality principles related to products (such as features, fitness-for-use, freedom from defects, etc.) and processes (such as monitoring, measuring, continuous improvement, etc.) (Understand)                |  |
| 1A3   | 3. Quality standards, requirements, and specifications<br>Define and distinguish between national or international standards, customer requirements, and product or process specifications. (Understand)  |  |
| 1A4   | 4. Cost of quality (COQ)<br>Describe and distinguish between the four classic cost of quality categories (prevention, appraisal, internal failure, external failure) and classify activities appropriately. (Apply)   | Added ‘classifying activities in the appropriate COQ categories’ & changed cognitive level from Understand to Apply. |
| 1A5   | 5. Six sigma<br>Identify key six sigma concepts and tools, such as, green belt and black belt roles and responsibilities, project types, processes used, and terms such as, quality function deployment (QFD), design, measure, analyze, improve, control (DMAIC) etc. (Remember) | Added examples of tools: QFD & DMAIC   |
|   | 6. Lean<br>Identify key lean concepts and tools commonly used to eliminate waste such as, 5S, value-stream mapping, flow, pull etc. (Remember)  | Lean is now a separate subtopic, with lean tools specified; lean manufacturing was part of old 1A6                   |
| 1A6   | 7. Continuous improvement techniques<br>Define and use various continuous improvement techniques including the Plan Do Check Act (PDCA) cycle, brainstorming, benchmarking, etc. (Understand)   | Added ‘brainstorming’ from old 1C2   |

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|--|---|--|
| 1B   | <b>B. Quality Tools</b><br>Select, construct, apply, and interpret the seven basic quality tools: 1) cause and effect diagrams, 2) flowcharts (process maps), 3) check sheets, 4) Pareto diagrams, 5) scatter diagrams, 6) control charts, and 7) histograms. (Evaluate)                                      |  |
| 1C1  | <b>C. Team Functions</b><br>1.Meeting management<br>Define, describe, and apply various meeting management techniques, including selecting team members, creating and following an agenda, facilitation techniques, recording and distributing minutes, establishing ground rules and protocols, etc. (Apply) | Added team member selection & team facilitation techniques |
| 1C2  | 2.Team building methods<br>Apply basic team building methods and concepts, such as, group dynamics, decision-making tools (i.e., majority voting, multi-voting, consensus), and creative-thinking tools (i.e., nominal group technique (NGT), etc. (Apply)  | Changed title and listed common tools;                     |
| 1C3  | 3.Team stages<br>Describe the team development stages of forming, storming, norming, and performing, (Understand)   |  |
| 1C4  | 4.Global communication<br>Define and describe the impact that globalization has on team-related issues, including developing and participating on virtual teams, using electronic communications to support distant collaboration, etc. (Understand)  | Changed title from 'Globalization'                         |
| <b>II. Statistical Techniques (18 Questions)</b> |   | <b><u>Decreased</u> by 3 questions</b>                     |
| 2A1  | <b>A. General Concepts</b><br>1.Terminology<br>Identify and differentiate between statistical terms such as population, sample, parameter, statistic, statistical process control (SPC), etc. (Understand)  | Deleted "statistical quality control" from subtext         |
| 2A2  | 2.Frequency distributions<br>Define and compute normal, Poisson, and binomial frequency distributions. (Apply)  |  |
| 2A3<br>2A4                                       | <b>Deleted</b> Design Of Experiments<br><b>Deleted</b> Reliability  |  |

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|------------|---|--|
| 2B1        | <b>B. Calculations</b><br>1.Measures of central tendency<br>Define, compute, and interpret mean, median, and mode. (Analyze)  |  |
| 2B2        | 2.Measures of dispersion<br>Define, compute, and interpret standard deviation, range, and variance. (Analyze)   |  |
| 2B3        | 3.Statistical inference<br>Determine, calculate, and apply confidence levels in various situations. (Apply)   |  |
| 2B4        | 4.Confidence limits<br>Determine, calculate, and apply confidence limits in various situations. (Apply)   |  |
| 2B5        | 5.Probability<br>Calculate probability using the basic concepts of combinations, permutations, and area under the normal curve. (Apply)   |  |
| 2B6<br>2B7 | <b>Deleted Student's t</b><br><b>Deleted ANOVA</b>  |  |
| 2C2        | <b>C. Control Charts</b><br>1. Control limits vs. specification limits<br>Identify and describe the different uses of control limits and specification limits. (Understand)               |  |
| 2C1<br>2C3 | 2. Variables charts<br>Identify, select, construct, and interpret variables charts such as $\bar{X} - R$ , $\bar{X} - s$ , etc. (Analyze)   | Includes Techniques and Application from old 2C1 |
| 2C1<br>2C4 | 3. Attributes charts<br>Identify, select, construct, and interpret attributes charts such as p, np, c, u, etc. (Analyze)  | Includes Techniques and Application from old 2C1 |
| 2C5        | <b>Deleted Rational Subgroups</b>   |  |
| 2C6        | 4. Process capability measures<br>Define the prerequisites for capability, and calculate and interpret $C_p$ , $C_{pk}$ , and capability ratio ( $C_R$ ) in various situations. (Analyze) |  |

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|--|---|--|
| 2C7  | <b>Deleted</b> Machine Capability   |  |
| 2C8  | <b>Deleted</b> PRE-control chart  |  |
| 2C9  | 5. Common and special cause variation<br>Interpret various control chart patterns (runs, hugging, trends, etc.) and use rules for determining statistical control to distinguish between common cause and special cause variation. (Analyze)  |  |
| 2C10   | 6. Data plotting<br>Identify the advantages and limitations of using this method to analyze data visually instead of numerically. (Understand)  |  |
| <b>III. Metrology and Calibration (17 Questions)</b> |   | <u>Decreased</u> by 2 questions  |
|  | <b>A. Measurement and Test Equipment (M&amp;TE)</b><br>Describe, select, and use the following types of tools, and evaluate their measurement results to determine conformance to specifications. (Evaluate )   |  |
| 3A1-3A12<br>4B8                                      | <ol style="list-style-type: none"> <li>1. Hand tools (e.g., calipers, micrometers, linear scales, analog, digital, vernier scales)</li> <li>2. Gauges (e.g., pins, thread, custom gauges)</li> <li>3. Optical tools (e.g., comparators, profiles, microscopes)</li> <li>4. Coordinate measuring machines (CMM)</li> <li>5. Electronic measuring equipment (e.g., digital displays, output)</li> <li>6. Weights, balances, and scales</li> <li>7. Hardness testing equipment (e.g., Brinell, Rockwell)</li> <li>8. Surface plate equipment and methods</li> <li>9. Surface analyzers (e.g., optical flats, roughness testers)</li> <li>10. Force measurement tools (e.g., torque wrenches, tensiometers)</li> <li>11. Angle measurement tools (e.g., protractors, sine bars, angle blocks, gage blocks)</li> <li>12. Color measurement tools (e.g., spectrophotometer, color guides, light boxes)</li> </ol> | <p>Added 'analog, digital, and vernier scales' from old 4B8</p> <p>Added 'gage blocks' to 3A11 from old 3A13</p> |

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|-------------|---|--|
| 3A13<br>3B1 | <p><b>B. Control and maintenance of M&amp;TE</b></p> <p>1.M&amp;TE identification, control and maintenance<br/>Describe various methodologies for identifying and controlling M&amp;TE to meet traceability requirements and appropriate techniques for maintaining such equipment to obtain optimum performance. (Apply)</p>       | Includes “gauge maintenance” from old 3A13 |
| 3B5         | <p>2.Customer-supplied M&amp;TE<br/>Describe and apply requirements for validation and control of customer-supplied equipment. (Apply)</p>  |  |
| 3B2         | Moved Gauge R&R studies to 4B3  |  |
| 3B3         | <p><b>C. Calibration</b></p> <p>1. Calibration intervals<br/>Establish calibration schedules on the basis of M&amp;TE usage history and gauge repeatability and reproducibility (R&amp;R) data. Describe the potential impact of using out-of-calibration tools or failing to calibrate equipment on a regular basis. (Analyze)</p> |  |
| 3B4         | <p>2. Calibration error<br/>Identify the causes of calibration error and its effect on processes and products. (Understand)</p>   |  |
| 3B5         | Moved customer-supplied equipment to 3B2  |  |
|             | <b>IV. Inspection and Test (23 Questions)</b>   | <u>Increased</u> by 2 questions            |
| 4A1         | <p><b>A. Blueprint Reading and Interpretation</b></p> <p>1.Blueprint symbols and components<br/>Interpret drawings and apply requirements in various test and inspection activities. (Analyze)</p>  |  |
| 4A2         | <p>2.Geometric dimensioning and tolerancing (GD&amp;T) terminology<br/>Define and use GD&amp;T terms covered in the ASME Y14.5 standard. (Analyze)</p>  |  |

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|------------|--|--|
| 4A3        | 3. Classification of product defect characteristics<br>Define, distinguish between, and classify defect characteristics in terms of critical, major, minor, etc. (Apply)   |  |
| 4B1        | <b>B. Inspection Concepts</b><br>1. Types of measurements<br>Define and distinguish between direct, differential, and transfer measurements. (Understand)  |  |
| 4B2        | 2. Gauge selection<br>Determine which measurement instrument to use in various situations, based on considerations such as the characteristic to be measured, test uncertainty ratio (TUR), test accuracy ratio (TAR), etc. (Analyze)  | Added Test uncertainty ratio (TUR) and Test accuracy ratio (TAR)               |
| 3B2<br>4B3 | 3. Measurement systems analysis (MSA)<br>Define and distinguish between measurement terms such as correlation, bias, linearity, precision-to-tolerance, percent agreement, etc. Describe how gauge repeatability and reproducibility (R&R) studies are performed and how they are applied in support of MSA. (Analyze) | Title changed from “Gauge R&R” to MSA. Includes Gauge R&R studies from old 3B2 |
| 4B4        | 4. Rounding rules<br>Use truncation and rounding rules on both positive and negative numbers. (Apply)  |  |
| 4B5        | 5. Conversion of measurements<br>Convert between metric and English units. (Apply)   |  |
| 4B6        | 6. Inspection points<br>Define and distinguish between inspection point functions (receiving, in-process, final, source, first-article, etc.), and determine what type of inspection is appropriate at different stages of production, from raw materials through finished product. (Apply)                            |  |
| 4B7        | 7. Inspection error<br>Define various types of inspection error, including parallax, fatigue, flinching, distraction, etc. (Understand)  |  |
| 4B8        | Moved Measurement scales to 3A1  |  |

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|----------|--|---|
| 4B9      | 8. Product traceability<br>Describe the requirements for documenting and preserving the identity of a product and its origins. (Understand)  |   |
| 4B10     | 9. Certificates of compliance (COC) and analysis (COA)<br>Define and distinguish between these two types of certificates. (Understand)   |   |
| 4C1      | <b>C. Inspection Techniques and Processes</b><br>1. Nondestructive testing (NDT) techniques<br>Identify various NDT techniques ( X-ray, eddy current, ultrasonic, liquid penetrant, electromagnetic, magnetic particle etc. ) for specific applications. (Understand)  | Changed: “Dye penetrant” to “liquid penetrant”  |
| 4C2      | 2. Destructive testing techniques<br>Identify various destructive tests (tensile, fatigue, flammability etc.) for specific applications. (Understand)  |   |
| 4C3      | 3. Other testing techniques<br>Identify characteristics of testing techniques such as those used for electrical measurement (DC, AC, resistance, capacitance, etc.), chemical analysis (pH, conductivity, chromatography, etc.), and physical/mechanical measurement (pressure tests, vacuum, flow, etc.) (Remember) | <b>Deleted:</b> Software testing/ verification (safeguarding, functional checks, comparing test results, identifying attributes and parameters) |
| 4D1      | <b>D. Sampling</b><br>1. Sampling characteristics<br>Identify and define sampling characteristics such as operating characteristic (OC) curve, lot size, sample size, acceptance number, switching rules, etc. (Apply)   |   |
| 4D2      | 2. Sampling types<br>Define and distinguish between fixed sampling, 100% inspection, attributes and variables sampling, etc. (Apply)   |   |
| 4D3      | 3. Selecting samples from lots<br>Determine sample size (e.g., AQL), selection method and accept/reject criteria (e.g., zero-defect sampling) used in various situations. (Apply)  |   |
| 6C1      | <b>E. Nonconforming material</b><br>1. Identifying and segregating<br>Determine whether products or material meet conformance requirements, and use various methods to label and segregate nonconforming materials. (Apply)  |   |

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|--|---|---|
| 6C2  | 2. Material review process<br>Describe various elements of this process, including the function of the material review board (MRB), the steps in determining fitness-for-use and product disposition, etc. (Understand)   |   |
| <b>V. Quality Audits (11 Questions)</b>                          |   | <u>Increased</u> by 2 questions   |
| 5A   | <b>A. Audit types</b><br>Define basic audit types: 1) internal, 2) external, 2) systems, 3) product, 4) process; and 5) distinguish between first-, second-, and third-party audits. (Understand)   |   |
| 5B   | <b>B. Audit components</b><br>Describe and apply various elements of the audit process: 1) audit purpose and scope, 2) audit reference standard, 3) audit plan (preparation), 3) audit performance, 4) opening and closing meetings, 5) final report and verification of corrective action. (Apply)   | Added audit purpose, scope, and final report, and clarified 'verification'  |
| 5C   | <b>C. Audit tools and techniques</b><br>Define and apply various auditing tools: 1) checklists and working papers, 2) data gathering and objective evidence, 3) forward- and backward-tracing, 4) audit sampling plans and procedural guidelines. (Apply)   | Moved interview techniques to 5D  |
| ---  | <b>D. Audit communication tools</b><br>Identify and use appropriate interviewing techniques and listening skills in various audit situations, and develop and use graphs, charts, diagrams, and other aids in support of written and oral presentations. (Apply)  | Included 'interview techniques' from old 5C; added listening skills and use of graphics in support of presentations |
| <b>VI. Corrective and Preventive Action (CAPA) (9 Questions)</b> |   | <u>Decreased</u> by 1 questions   |
| 6B1<br>6B2   | <b>A. Corrective action</b><br>Identify and apply elements of the corrective action process: identify the problem, contain the problem ( interim action), assign responsibility (personnel) to determine the causes of the problem and propose solutions to eliminate it or prevent its recurrence (permanent action), verify that the solutions are implemented, and confirm their effectiveness (validation). (Apply) | Combined old 6B1 and 6B2 and moved to 6A0   |

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|------------|---|--|
| 6A         | <p><b>B. Preventive action</b><br/>                     Identify and apply elements of a preventive action process: use various data analysis techniques (e.g., trend analysis, failure mode and effects analysis (FMEA) product and process monitoring reports) to identify potential failures, defects, or process deficiencies; assign responsibility for improving the process (develop error- or mistake-proofing devices or methods, initiate procedural changes, etc.), and verify the effectiveness of the preventive action. (Apply)</p> | Description of preventive action expanded. |
| 6C1<br>6C2 | Moved Nonconforming material to 4E1 & 4E2   |  |