



## Certified Master Black Belt

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. Master Black Belts have outstanding leadership abilities, are innovative, and demonstrate a strong commitment to the practice and advancement of quality and improvement.

Becoming certified as a Master Black Belt confirms your commitment to quality and the positive impact it will have on you and your organization.

## Certified Master Black Belt

# Information

The Certified Master Black Belt is aimed at individuals who possess exceptional expertise and knowledge of current industry practice. Master Black Belts have outstanding leadership ability, are innovative, and demonstrate a strong commitment to the practice and advancement of quality and improvement. Obtaining an ASQ Master Black Belt is acceptance and recognition from your peers.

### Examination

Each certification candidate is required to pass a written examination that consists of multiple-choice questions that measure comprehension of the Body of Knowledge. The Master Black Belt certification is a five-hour examination that has two assessment components, a 100-item multiple-choice test, and a performance-based assessment that includes situation-specific materials that candidates will be directed to evaluate and respond to. It is offered in English only.

### Required Experience

To become certified as an ASQ MBB, a candidate must successfully meet all requirements. To be eligible to apply for the MBB examination, a candidate must hold a current ASQ Certified Six Sigma Black Belt (CSSBB)\* certificate. In addition, a candidate must have either of the following experience levels.

- 1) At least 5 years of experience in the role of a SSBB or MBB.
- OR
- 2) Completion of 10 Six Sigma Black Belt projects.

Candidates must be able to meet these minimum eligibility requirements to have their portfolio reviewed.

\*For those applicants whose ASQ CSSBB certificate has expired, ASQ will waive the requirement of holding a "current" ASQ CSSBB through December 31, 2011. After that date, all applicants will be required to hold a current CSSBB.

### Portfolio Review

Once a candidate has met the eligibility requirements, the next step in the process is a portfolio review of the candidate's body of SSBB or MBB work. When the review panel approves a candidate's portfolio, the candidate will be eligible to register for and take the MBB examination. Only after successfully completing all requirements and passing the examination will candidates receive MBB certification.

The Master Black Belt also requires a Portfolio application. Visit <http://www.asq.org/certification/docs/mmb-portfolio-app-w-fillable-fields.pdf> to acquire this application

Your Portfolio must include the following topics to be reviewed by a panel of expert MBBs showing evidence of: teaching, coaching, mentoring, occupational experience and responsibility, technical experience, and innovation.

Candidates must meet the *minimum* scoring requirements for each of the three key performance indicators.

- Teaching, Coaching, Mentoring
- Occupational Experience and Responsibility
- Technical Experience/Innovation

The portfolio evaluation process will be conducted by a panel of subject matter experts who are Master Black Belts themselves. This panel will operate independently but under the guidance of ASQ. The panel will have ultimate responsibility for judging the quality and appropriateness of the material and evidence presented in the portfolio.

Candidates who meet the required minimums for each section of the portfolio will receive an approval letter from the review panel stating that they are eligible to take the MBB examination. Candidates who do not achieve the necessary points will receive feedback from the review panel. This feedback will include information about why the application failed resubmission requirements, additional evidence requests, etc.

# Body of Knowledge

## Certified Master Black Belt

The **topics** in this Body of Knowledge (BOK) include descriptive details (subtext) that will be used by the Exam Development Committee as guidelines for writing test questions. This subtext is also designed to help candidates prepare for the exam by identifying specific content within each topic that may be tested. The subtext is not intended to limit the subject matter or be all-inclusive of what might be covered in an exam but is intended to clarify how the topics relate to a Master Black Belt's role. 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. Enterprise-wide Planning and Deployment (25 questions)

#### A. Strategic plan development

Describe strategic planning tools and methods (hoshin kanri, SWOT, PEST, etc.) and their utilization in developing enterprise planning. (Apply)

#### B. Strategic plan alignment

##### 1. Strategic deployment goals

Describe how to develop strategic deployment goals. (Apply)

##### 2. Project alignment with strategic plan

Describe how to align projects to the organizational strategic plan. (Apply)

##### 3. Project alignment with business objectives

Describe how projects are aligned with business objectives. (Apply)

#### C. Deployment of six sigma systems

Describe the following key deployment elements. (Apply)

##### 1. Governance (quality councils or process leadership teams)

##### 2. Assessment (maturity models and organizational readiness)

##### 3. Resource planning (identify candidates and costs/benefits)

##### 4. Resource development (train and coach)

##### 5. Execution (deliver on project results)

##### 6. Measure and improve the system (drive improvement into the systems, multiphase planning)

#### D. Six sigma methodologies

Demonstrate an advanced understanding of the following methodologies, including their associated tools and techniques. (Apply)

##### 1. DMAIC

##### 2. DFSS

##### 3. Lean

##### 4. Business systems and process management

#### E. Opportunities for improvement

##### 1. Project identification

Facilitate working sessions to identify new project opportunities that can be prioritized. (Apply)

##### 2. Project qualification

Determine the elements of a well-defined project (i.e., business case), the process for approving these projects, and tools used in project definition (QFD, process maps, value stream maps, FMEA, CTx (critical to ... customer, ... design, ... quality), etc. (Apply)

##### 3. Stakeholder engagement

Describe how to engage stakeholders. (Apply)

##### 4. Intervention techniques

Describe techniques for intervening across levels to prevent potential project failures. (Apply)

##### 5. Creativity and innovation tools

Use these tools to develop concept alternatives. (Apply)

#### F. Risk analysis of projects and the pipeline

##### 1. Risk management

Use risk management and analysis tools to analyze organizational elements, to appraise portfolios and critical projects, and to identify potential problem areas. (Evaluate)

##### 2. Pipeline creation

Create, manage, and prioritize a pipeline of potential projects for consideration. (Create)

##### 3. Pipeline management

Create a selection process that provides a portfolio of active six sigma opportunities that are clearly aligned and prioritized to meet/exceed strategic goals. (Create)

#### G. Organizational design

##### 1. Systems thinking

Apply systems thinking to anticipate the effect that components of a system can have on other subsystems and adjacent systems. Analyze the impact of actions taken in one area of the organization and how those actions can affect other areas or the customer, and use appropriate

tools to prevent unintended consequences. (Analyze)

#### H. Organizational maturity and culture

Describe the implications these factors can have on six sigma implementation, including potential barriers. (Understand)

#### I. Organizational culture change techniques

Describe techniques for changing an organizational culture, such as rewards and recognition, team competitiveness, communications of program successes, and appropriate cascading of goals throughout the organization. (Apply)

#### H. Organizational commitment

##### 1. Techniques to gain commitment

Describe how to gain commitment from the organization's leadership for the six sigma effort. (Understand)

##### 2. Necessary organizational structure for deployment

Develop the inherent organizational structure needed for successful deployment. (Apply)

##### 3. Communications with management

Describe elements of effective communications with management regarding organizational benefits, failures, and lessons learned. (Apply)

##### 4. Change management

Describe the MBB role in change management and apply various techniques to overcome barriers to successful organizational deployment. (Apply)

#### I. Organizational finance and business performance metrics

##### 1. Financial measures

Define and use financial measures, including revenue growth, market share, margin, cost of quality (COQ), net present value (NPV), return on investment (ROI), cost-benefit analysis, activity-based cost analysis, and breakeven time performance, etc. (Analyze)

2. **Business performance measures**  
Describe various business performance measures, including balanced scorecard, key performance indicators (KPIs), and the financial impact of customer loyalty; and describe how they are used for project selection, deployment, and management. (Analyze)
3. **Project cash flow**  
Develop a project cash flow stream. Describe the relation of time to cash flow and difficulties in forecasting cash flow. (Analyze)
4. **Sarbanes-Oxley (SOX) Act**  
Understand the requirements for financial controls dictated by SOX. (Understand)

## II. Cross-functional Competencies (15 Questions)

### A. Data gathering

Assess the appropriate collection of Voice of the Customer and Voice of the Process data, both internal and external, and develop a customer-focused strategy for capturing and assessing customer feedback on a regular basis. (Evaluate)

### B. Internal organizational challenges

1. **Organizational dynamics**  
Use knowledge of human and organizational dynamics to enhance project success and align cultural objectives with organizational objectives. (Apply)
2. **Intervention styles**  
Use appropriate intervention, communications, and influence styles, and adapt those styles to specific situations (i.e., situational leadership). (Apply)
3. **Interdepartmental conflicts**  
Address and resolve potential situations that could cause the program or a project to under-perform. (Apply)

### C. Executive and team leadership roles

1. **Executive leadership roles**  
Describe the roles and responsibilities of executive leaders in the deployment of six sigma in terms of providing resources, managing change, communicating ideas, etc. (Analyze)
2. **Leadership for deployment**  
Create action plans to support optimal functioning of master black belts, black belts, green belts, champions, and other participants in the deployment effort. Design, coordinate, and participate in deployment activities, and ensure that project leaders and teams have the required knowledge, skills, abilities, and attitudes to support the organization's six sigma program. (Create)

## III. Project Management (15 Questions)

### A. Project execution

1. **Cross-functional project assessment**  
Appraise interrelated projects for scope overlap and refinement and identify opportunities for leveraging concomitant projects. Identify and participate in the implementation of multi-disciplinary redesign and improvement projects. (Analyze)
2. **Executive and mid-level management engagement**  
Formulate the positioning of multiple projects in terms of providing strategic advice to top management and affected mid-level managers. (Create)

3. **Project prioritization**  
Prioritize projects in terms of their criticality to the organization. (Apply)

### B. Project oversight and management

1. **Project management principles**  
Oversee critical projects and evaluate them in terms of their scope, goals, time, cost, quality, human resources requirements, communications needs, and risks. Identify and balance competing project demands with regard to prioritization, project resources, customer requirements, etc. (Evaluate)
2. **Measurement**  
Support and review the development of an overall measurement methodology to record the progress and ongoing status of projects and their overall impact on the organization. (Evaluate)
3. **Monitoring**  
Apply appropriate monitoring and control methodologies to ensure that consistent methods are used in tracking tasks and milestones. (Apply)
4. **Project status communication**  
Develop and maintain communication techniques that will keep critical stakeholders and communities apprised of project status, results, and accountability. (Create)
5. **Supply/Demand management**  
Generate accurate project supply/demand projections, associated resource requirements analysis, and mitigate any issues. (Create)
6. **Corrective action**  
Facilitate corrective actions and responses to customers about the corrective action and its impact. (Apply)

### C. Project management infrastructure

1. **Governance methods and tools**  
Develop governance documents, tracking tools, and other methodologies that will support project success. (Create)
2. **Performance measurement**  
Design a system for measuring project and portfolio performance. (Create)

### D. Project financial tools

1. **Budgets and forecasts**  
Assess and explain budget implications, forecasting, measurement, monitoring, risk analysis, and prioritization for portfolio level projects. (Evaluate)
2. **Costing concepts**  
Define the concepts of hard and soft dollars and use cost of poor quality tools, activity-based costing, and other methods to assess and prioritize portfolios. (Apply)

## IV. Training Design and Delivery (10 Questions)

### A. Training needs analysis

Assess the current level of knowledge and skills in each target group in relation to the skills and abilities that are needed. Conduct a gap analysis to determine the training needs for each target group. (Evaluate)

### B. Training plans

Design training plans to close the knowledge and skills gaps. Refine the plans based on the number of people needing to be trained in a particular technique or skill, and whether multi-disciplinary or multi-level competency training is appropriate. (Create)

### C. Training materials and curriculum development

#### 1. Adult learning theory

Evaluate and select training materials and resources that adhere to adult learning theories. (Analyze)

#### 2. Integration

Ensure that the training harmonizes and leverages other tools and approaches being used and that it is aligned with the organization's strategic objectives and culture. (Evaluate)

#### 3. Training delivery

Monitor and measure training to ensure that it is delivered effectively and efficiently by qualified individuals. (Apply)

### D. Training effectiveness evaluation

Develop an evaluation plan to assess and verify the acquisition of required knowledge and skills. (Create)

## V. Mentoring Responsibilities (10 Questions)

### A. Mentoring champions, change agents, and executives

#### 1. Project reviews

Collaborate with executives and champions on reviewing projects, including timing, questions to ask, and setting expectations for project timing and completion. (Create)

#### 2. Project sizing

Collaborate with executives and champions on sizing projects and selecting individuals and assignments for various projects. (Evaluate)

#### 3. Communications

Coach executives and champions on the need for constancy of purpose and message, and the importance of using clear communication techniques and consistent messages. (Evaluate)

#### 4. Feedback

Use constructive techniques to provide feedback to champions and executives. (Evaluate)

### B. Mentoring black belts and green belts

#### 1. Individuals

Develop a career progression ladder for black belts and green belts. Assess their progress and provide constructive feedback to enable them to work effectively on team projects. Use coaching, mentoring, and intervention skills as needed, including canceling or reassigning projects if necessary. (Evaluate)

#### 2. Technical reviews

Create guidelines and expectations for project reviews, and perform them in a timely manner. Assist project leaders in selecting appropriate content for presentation to management. (Create)

#### 3. Team facilitation and meeting management

Practice and teach meeting control, analyze team performance at various stages of team development, and support appropriate interventions for overcoming team challenges, including floundering, reviewing and diagnosing failing projects, etc. (Create)

### C. Mentoring non-belt employees

Develop information that will help non-belt project participants to advance their understanding of six sigma and develop the necessary skills and knowledge to become green belts or black belts. (Create)

## VI. Advanced Measurement Methods and Tools (25 Questions)

### A. Measurement systems analysis (MSA)

- 1. Propagation of errors**  
Use this technique to evaluate measurement systems and calculated values. (Evaluate)
- 2. Attribute (discrete) measurement systems**  
Use various tools and methods (e.g., percent agreement, Kappa, Kendall, intra-class correlation coefficient (ICC) to analyze and interpret discrete measurement systems data. (Evaluate)
- 3. Variables (continuous) measurement systems**  
Use various tools and methods (e.g.,  $\bar{X} - R$ ,  $\bar{X} - s$ , individual and moving range) to analyze and interpret continuous measurement systems data. (Evaluate)
- 4. Process capability for non-normal data**  
Calculate capability using Weibull and other methods for non-normal data. (Apply)

### B. Measuring and modeling relationships between variables

- 1. Autocorrelation and forecasting**  
Identify auto correlated data, including time-series modeling (e.g., ARIMA) and forecasting. (Understand)
- 2. Multiple regression analysis**  
Apply and interpret multiple regression analysis, including using variance inflation factors (VIFs) to identify collinearity issues. (Apply)
- 3. Logistic regression analysis**  
Apply and interpret logistic regression analysis, including binary, ordinal, and nominal data considerations. (Apply)
- 4. Model fitting for non-linear parameters**  
Apply and interpret fits of models that are non-linear. (Apply)
- 5. General linear models (GLM)**  
Apply and interpret GLMs using assumptions and assumptions testing. Compare and contrast GLMs with various other models, including ANOVA results, (crossed, nested, and mixed models) simple linear regression, multiple regression, ANCOVA, and continuous MSA. (Apply)
- 6. Components of variation**  
Select, calculate, and interpret components of variation and nested design studies. (Evaluate)
- 7. Simulation**  
Apply simulation tools such as Monte Carlo, dynamic process simulation, queuing theory, etc. (Apply)

- 8. Linear programming**  
Understand how linear programming principles, such as critical path analysis, can be used in modeling diverse types of problems (e.g., planning, routing, scheduling, assignment, design) to optimize system performance. (Understand)
- 9. Reliability modeling**  
Use reliability modeling and tools to enhance reliability of a product or process and reliability growth modeling. (Apply)
- 10. Qualitative analysis**  
Use appropriate qualitative analysis tools (affinity diagrams, force field analysis, etc.) and analyze the results. (Analyze)

### C. Design of experiments (DOE)

- 1. Factor analysis**  
Apply and interpret factor relationship diagrams. (Apply)
- 2. Complex blocking structures**  
Recognize other designs for handling more complex blocking structures, including balanced incomplete block design (BIBD). (Understand)
- 3. Other DOE approaches**  
Recognize when other DOE approaches (e.g., response surface methodology (RSM), mixture experiments, evolutionary operations (EVOP), split-plot designs, Taguchi, D-optimal designs, etc.) should be applied. (Understand)

### D. Automated process control (APC) and statistical process control (SPC)

- Recognize when to use APC instead of or in conjunction with SPC. (Understand)

## Topics for Performance-based Section of Certified Master Black Belt

For this part of the examination, candidates will be presented with a situation in which an organization is considering various six sigma projects to implement. Typically, background information about the parent company will be provided as well as documents containing key details of the projects. Open-ended questions will be asked about this organization and the projects.

For example, candidates might be expected to: evaluate projects in terms of organization-wide goals, create presentations with content that is appropriate for a specific audience, communicate with staff at various levels in the organization, analyze output from projects at various stages, determine whether to continue supporting projects or close them out, etc.

This portion of the test will be developed and scored using the descriptions and cognitive levels outlined in the performance-based (PB) entries of the BOK, as described here.

### PB-1. Enterprise-wide Planning and Deployment

Apply project selection criteria to select and prioritize potential six sigma projects using strategic planning tools, immediate- and long-term business goals, executive-level directives, risk analysis results, etc. Develop and deliver formal presentations that support the project selection process, identify progress, explain its status at conclusion, etc.

### PB-2. Cross-functional Competencies

Use feedback and process data from various sources to identify or develop six sigma projects that will respond to customer needs, eliminate process barriers, or streamline processes, especially for managing projects that cross boundaries either within or between organizations. Use appropriate communication methods that are sensitive to specific audiences when explaining projects or solutions, encouraging participation, or resolving issues that arise between interorganizational groups

### PB-3. Project Management

Develop and manage the scope, schedule, cost, and risk of six sigma projects using various project management tools to ensure proper monitoring, milestone achievement, and project success. Recognize when intervention steps must be taken to bring a project back on track or terminate it based on analysis of internal or external events.

### PB-4. Training and Mentoring

Identify situations that require training or mentoring for all levels of participants in six sigma projects, from executive level champions to non-belt participants. Develop, review, and deliver information, training, or mentoring as needed for a variety of six sigma projects, based on needs analysis, participant requests, or recognition of situations that require intervention.

## Levels of Cognition

*Based on Bloom's Taxonomy—Revised (2001)*

In addition to content specifics, the subtext for each topic in this BOK also indicates the intended complexity level of the test questions for that topic. These levels are based on "Levels of Cognition" (from *Bloom's Taxonomy—Revised, 2001*) and are presented below in rank order, from least complex to most complex.

### Remember (Knowledge Level)

Recall or recognize terms, definitions, facts, ideas, materials, patterns, sequences, methods, principles, etc.

### Understand (Comprehension Level)

Read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

### Apply (Application Level)

Know when and how to use ideas, procedures, methods, formulas, principles, theories, etc.

### Analyze (Analysis Level)

Break down information into its constituent parts and recognize their relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario.

### Evaluate (Evaluation Level)

Make judgments about the value of proposed ideas, solutions, etc., by comparing the proposal to specific criteria or standards.

### Create (Synthesis Level)

Put parts or elements together in such a way as to reveal 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.

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