



# Certified Construction Quality Manager (CCQM)



## Body of Knowledge

The topics in this Body of Knowledge include additional detail in the form of subtext explanations and the cognitive level at which test questions will be written. This information will provide guidance for 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. Pre-contract Phase (13 Questions)

### A. Project delivery, contract, and payment models

#### 1. Project delivery methods

Identify various types of clients (e.g., private, commercial, federal, state, municipal, and international) and their use of project delivery methods, such as Engineering, Procurement, Construction Management (EPCM), Design-Bid-Build (DBB), Design-Build (DB), Design, Build, Finance, and Maintain (DBFM), Construction Manager at Risk (CMAR), and Construction Manager for Fee (CMFF). Understand project lifecycle phases (e.g., project initiation, project planning, project execution, monitoring & control, and project closeout) align with the project delivery method. **(Understand)**

#### 2. Contract types

Understand various types and sources of contracts (e.g., Public-Private Partnership (P3), Design-Build Institute of America (DBIA), American Institute of Architects (AIA), International Federation of Consulting Engineers (FIDIC), lump sum, subcontract, consultant agreement, consultant staffing agreement, joint venture contracts, and purchase orders) along with their quality requirements. Recognize contract terms and conditions (e.g., liquidated damages [LDs], liquidated and ascertained damages [LADs], and general damages [GDs]). **(Understand)**

#### 3. Payment models and methods

Understand the risks associated with and the differences between payment models (e.g., unit rates and reimbursable costs) and methods (e.g., Guaranteed Maximum Price (GMP)). **(Understand)**

#### 4. Payment documentation requirements

Understand payment documentation requirements, such as schedule of values, percent completion determination (cost complete vs. work complete), retainage, billing methods, and billing terms. **(Understand)**



## B. Contractual requirements

### 1. Scope, schedule, and resource planning

Define a project's scope components (e.g., boundaries), develop the schedule and resource plan, track milestones, and identify roles and responsibilities in terms of quality of different entities (e.g., trade partner, contractor, owner, and quality manager). (Analyze)

### 2. Quality management inputs

Determine and analyze quality management inputs (e.g., Certificate of Authorization (CoA), input for proposals, and Request for Proposal (RFP)) to adhere to a project's quality standards. (Analyze)

### 3. Stakeholders

Identify and acknowledge internal and external stakeholders and engage them. (Apply)

### 4. Local contract opportunities and contract values

Understand the impact of local contract (e.g., DBE, SWaM, local small businesses and suppliers) opportunities and contract values (e.g., allocation percentages to local resources) in relation to the quality of a project. (Understand)

### 5. Procurement and contracting methods

Understand procurement methods, such as sole source, single source, competitive bid, lowest bid, technical bid, and contracting methods, such as general contracting, and subcontracting. Identify and understand the best value proposal. (Understand)

### 6. Delegated design

Apply delegated design or specialized engineering to transfer specific design responsibilities for a project to a contractor or subcontractor and understand the associated risks. (Apply)

## C. Bid evaluation and finalization

### 1. Prequalification process

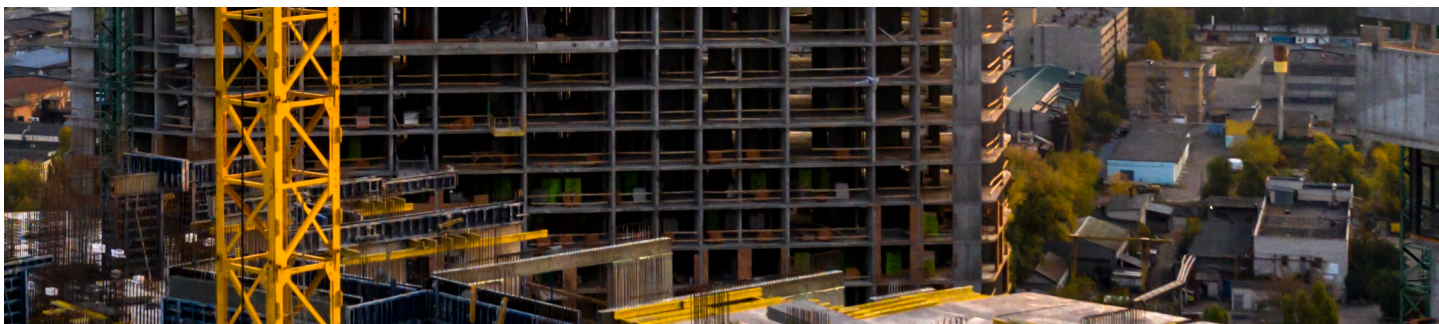
Analyze the role of audits in the prequalification process, align the prequalification process to meet organizational needs, and explain the prequalification process for short-listed bidders. (Analyze)

### 2. Criteria development

Review the criteria for assessing and comparing bids (e.g., dollars, schedule, lead times, workforce, products, assemblies, safety, sustainability) to integrate the bid criteria with quality requirements, critical to quality (CTQ) concepts, and examine bid criteria for the specific contract type in use. (Analyze)

### 3. Bidding process

Distinguish the role of quality requirements in the context of different contract types during the bidding process. Identify strategies and techniques for building consensus when finalizing quality requirements. (Analyze)



## II. Planning Phase (30 Questions)

### A. Strategic quality planning

#### 1. Project quality strategy development

Formulate a comprehensive project quality strategy, integrating stakeholder requirements (stated and implied), procurement requirements, contracting approaches, and regulatory compliance based on Authority Having Jurisdiction (AHJ), and securing management commitment. Establish key performance indicators (KPIs) to align with each element of the quality strategy. (Create)

#### 2. Environmental, social, and governance (ESG) practices

Apply sustainable practices and programs (e.g., LEED®, ENERGY STAR®, and Cradle to Cradle Certification), social responsibility, and governance standards to enhance the overall quality and long-term viability of projects. (Apply)

#### 3. Alignment of quality plan with other project plans

Create the quality plan, ensuring alignment with the quality strategy and technology strategy. Align the quality plan with other project plans, such as the Health, Safety, and Environment (HSE) Plan, Execution Plan, Communication Plan, project schedule, and Risk Management Plan. (Create)

### B. Quality management systems (QMS)

#### 1. Industry standards

Analyze the quality management system (QMS) to ensure it follows industry standards and understand how it complies with international standards (e.g., ISO 9001, ISO 10006, ISO 14001, and ISO 45001) to deliver quality outcomes. (Analyze)

#### 2. Quality Management Plan

Create a project-specific quality management plan (QMP) that complies with the appropriate QMS, incorporating policies and procedures (e.g., nonconformance control procedures, inspection and testing procedures, and method statements). Integrate PMBOK® Guide principles and system assurance practices into the development of the QMS and QMP. (Create)

#### 3. Quality assurance (QA)

Develop and implement quality assurance (QA) practices to verify the project meets quality specifications and is compliant with applicable standards by establishing standardized quality policies and procedures. (Create)

#### 4. Quality control (QC)

Develop and implement quality control (QC) measures such as an inspection and test plan to ensure compliance with requirements. (Create)

### C. Resource planning and analysis

#### 1. Resource assessment and mobilization

Identify the specific quality resources and timely availability needed for a project and develop a mobilization plan including allocation and a gap analysis of current and necessary resources. (Create)

#### 2. Roles of quality personnel and internal stakeholders

Ensure all relevant quality personnel and internal stakeholders understand the quality plan and have the necessary knowledge and skills to carry out their responsibilities. Formulate the roles and expectations of quality personnel, contribute to the personnel qualification process, and ensure all personnel understand their roles and responsibilities. (Create)

### **3. Training needs in quality management**

Identify a project team's quality-specific training needs to achieve project deliverables, develop a training plan, deploy the training, and evaluate the effectiveness of the training. (Create)

### **4. Third-party inspection and outsourcing**

Identify the need for third-party inspection services as applicable and develop criteria for selecting and integrating outsourced quality services into the project. (Create)

### **5. Measurement systems analysis**

Assess the measurement system and its requirements to verify if equipment accurately and reliably measures specific parameters. Ensure calibration and certification requirements are met and that all equipment, including equipment used by subcontractors, is accurate, precise, and compliant with relevant standards and regulations. (Evaluate)

### **6. Quality management tools and infrastructure**

Identify and assess quality tools (e.g., data analysis tools, statistical process control, dashboards, construction pre-control checklists, and budgets) and quality infrastructure essential for effective quality management. (Evaluate)

## **D. Quality audits**

### **1. Audit types**

Identify the appropriate type of audit (e.g., first-party, second-party, and third-party) for different situations, such as personnel independence from the area being audited. (Apply)

### **2. Quality audit plan**

Create and evaluate a quality audit plan that aligns with strategic objectives, key project controls, prime contractor audits, and compliance checks for areas at risk using specific, measurable, attainable, relevant, and time-bound tactics. (Create)

### **3. Audit performance**

Conduct a quality audit to evaluate the management system's effectiveness, review adherence to standards, and identify nonconformances through detailed observations. (Evaluate)

## **III. Design Phase (20 Questions)**

### **A. Design inputs**

#### **1. Quality objectives**

Examine the quality objectives set by the client, owner, or user from the initial scope agreement and determine how these objectives align with design inputs. Consider the delivery method and contract when reviewing design phase / development planning. (Analyze)

#### **2. Coordination of functional and nonfunctional requirements**

Explain the coordination between functional (e.g., foundation) and nonfunctional (e.g., finish) requirements and illustrate their application at various levels, such as system and component. Relate these requirements to industry standards and demonstrate their relationship to overarching quality objectives. (Apply)

#### **3. Design lessons learned and best practices**

Apply lessons learned from previous projects and industry best practices to design inputs. Understand the impact of value engineering on design. (Apply)

## **B. Design process**

### **1. Stakeholder involvement**

Determine key stakeholders involved in the design process for each discipline. Collaborate with the subject matter experts from each discipline responsible for making design decisions. Analyze the impact of these design decisions on quality. (Analyze)

### **2. Application of QMS in design feedback**

Apply QMS procedures and interdisciplinary reviews to address feedback related to quality requirements in the design process. (Analyze)

### **3. Functionality and constructability reviews**

Participate in reviews that assess the design's functionality and constructability. Provide quality inputs that focus on various aspects, such as complexity, inspectability, testability, reliability, durability, survivability, interoperability, compatibility, maintainability, and comparative cost of ownership. (Analyze)

## **C. Design outputs**

### **1. Quality objectives review**

Apply verification and validation to design outputs to evaluate whether quality objectives are met. (Apply)

### **2. Cross-disciplinary design review**

Support the design review process across multiple disciplines to identify and address gaps in design outputs using a design review checklist. Determine and address conflicts within the overarching system design, among individual component teams, and in interactions between component teams. (Analyze)

### **3. Criticality levels and inspection**

Analyze the proposed criticality levels for equipment and material. Identify appropriate inspection levels and methods (e.g., in-process inspection and third-party design review) based on criticality and budget considerations. (Analyze)

## **D. Quality controls in design**

### **1. Project controls**

Evaluate the effectiveness of project controls, including the timeline, in meeting the quality expectations of stakeholders, such as the client, owner, or user. (Evaluate)

### **2. Design review output**

Examine the design review output received at each phase (e.g., 30%, 60%, 90%) to determine its alignment with the expectations of stakeholders, such as the client, owner, or user. (Analyze)

### **3. Design changes**

Understand sources of design change communication, including requests for proposals (RFPs), change order directives, addenda, and requests for information (RFIs). Assess and track the impact of proposed design changes and determine the effectiveness of incorporating any agreed-upon changes into the contract. (Analyze)

### **4. Design verification and validation**

Understand design verification and validation and understand how the design output conforms to the design input through the use of reviews, inspections, and testing. (Understand)

## **E. Measurement and monitoring**

### **1. Design monitoring**

Examine design effectiveness and progress at various gates (e.g., schematic design (SD), design development (DD), construction documents (CD)) to align with the quality objectives and schedule. Address any deviations or issues discovered at each gate. (Analyze)

### **2. Peer reviews**

Identify the necessity of peer reviews (e.g., design peer reviews and third-party consultant reviews), evaluate their input, and incorporate them into the quality documentation process. (Evaluate)

### **3. Quality documentation**

Collaborate with the design review facilitator to document all quality-related activities, decisions, and changes, ensuring a comprehensive record for evaluating the design's adherence to quality standards. (Evaluate)

## **IV. Procurement (15 Questions)**

### **A. Quality requirements**

#### **1. Quality requirements for procurement**

Collaborate with engineering teams to design functional and nonfunctional quality requirements for the procurement of specific products or services. Analyze if these requirements are clearly defined, complete, correct, compliant, and coordinated. (Analyze)

#### **2. Trade partner requirement alignment**

Develop a strategy, incorporating methodologies such as first article inspection (FAI) and factory acceptance testing (FAT), to determine whether the trade partner's inspection and testing plan aligns with established quality requirements. Incorporate a rigorous review process for the inspection and test plans to ensure comprehensive evaluation. Additionally, integrate specific quality requirements for subcontractors and vendors, focusing on their scope of work, historical performance, compliance with standards, and the thoroughness of their documentation and plans. (Create)

### **B. Resource management**

#### **1. Pre-activity meetings**

Schedule, implement, and oversee pre-activity meetings (e.g., pre-assembly, pre-inspection, quality kick-off) to review the project's requirements with the relevant stakeholders. (Evaluate)

#### **2. Material control and resource identification**

Incorporate material control, material traceability, and vendor requirements into the project prior to commencement of work. Evaluate the resources needed for various inspections (e.g., self-inspection and certification, third-party inspection), including those conducted at the source and as mandated by regulations. (Evaluate)

#### **3. Resource mobilization and management**

Integrate resource qualification and training, along with warehouse quality and material management into the resource management process. Assess the need for specific resources tailored to each inspection type, ensuring that these resources are available and properly allocated, and aligned with the established inspection and test plan. (Evaluate)

## C. Risk management

### 1. Risk identification and analysis

Analyze various risk identification and assessment tools, including failure mode and effects analysis (FMEA), fault tree analysis (FTA), and strengths-weaknesses-opportunities-threats (SWOT) analysis. Examine risks based on quantitative and qualitative data related to potential impact on the project. (Analyze)

### 2. Risk treatment

Evaluate risk mitigation strategies such as risk transfer, retention, acceptance, avoidance. (Evaluate)

### 3. Risk monitoring

Use risk monitoring tools (e.g., risk-based audit programs) and perform surveillance audits to regularly evaluate identified risks and monitor key factors (e.g., cost, time, safety, supplier performance), and the criticality of material and equipment. (Evaluate)

## D. Quality reporting

### 1. Review and interpretation of quality documents

Evaluate inspection and test reports, quality records, and manufacturers' data books to ensure traceability. Assess conformance with product specifications and quality criteria. (Evaluate)

### 2. Documentation and communication of quality insights

Evaluate and document key insights from the quality management process to inform future actions. Communicate quality-related insights and determine the appropriate timing, escalation, and method to alert stakeholders about significant quality issues. (Evaluate)

### 3. Vendor performance evaluation

Analyze vendor performance periodically using quality key performance indicators (KPIs) and use supplier performance incentives (e.g., awards, more wallet share, premium). (Analyze)

## V. Construction (34 Questions)

### A. Quality plan deployment

#### 1. Construction plans and specifications

Assess plans and specifications (e.g., permanent and temporary work) in relation to the project's quality plan to meet established quality standards. (Evaluate)

#### 2. Required permits

Understand the importance of securing all essential permits before project commencement. (Understand)

#### 3. Construction submittals

Review various types of construction submittals (e.g., action and deferred/delegated), taking into consideration the interdependency across trades and the project's quality plan and standards. (Apply)

#### 4. Material evaluation

Evaluate materials to verify their conformity to project specifications. (Evaluate)

#### 5. Requests for information or changes

Participate in the process to track requests for information (RFIs), field change requests (FCRs), and design change requests (DCRs) to ensure the project remains on track and that objectives adapt when necessary. (Apply)

## **B. Process management**

### **1. Risk-based inspection and testing strategy**

Develop a risk-based inspection and testing strategy by identifying risks. Establish priorities for inspections, including modifications based on changes in project requirements (e.g., scope modifications), and testing in line with specifications (e.g., concrete testing) and accepted standards or regulations (e.g., welding certifications). (Create)

### **2. Quality management processes**

Identify inspection processes for various stages, including source, initial, intermediate, and continuous. Prioritize program inspections and tests based on their criticality, respective project stages, and potential impact on overall project quality, ensuring alignment with the project's evolving needs and scope changes. Identify the need for procedures for specialized tasks, such as welding, heat treatment, coating, and soldering. (Evaluate)

### **3. Quality control and monitoring**

Develop a system to address nonconformances, manage nonconformance reports (NCRs) and corrective action requests (CARs), and implement corrective and preventive action (CAPA). Design quality protocols and establish criteria for stop work notices. Establish a robust framework for maintaining quality records. Design a strategy for conducting site quality audits and create a mechanism for generating and distributing quality reports. (Create)

## **C. Destructive and nondestructive tests**

Determine the appropriate scenarios for using destructive and nondestructive test methods and verify those performing the tests are accredited or certified. (Evaluate)

## **D. Compliance management**

### **1. Laboratory accreditation**

Evaluate laboratory accreditation and conduct periodic reviews or surveillance audits based on project quality requirements. (Evaluate)

### **2. Compliance monitoring**

Assess compliance with applicable regulatory requirements, standards, and codes, and conformance to specifications, procedures, and drawings. Document defects and nonconformities, and collaborate with technical authorities and engineering disciplines to review, disposition, and resolve identified nonconformities. (Evaluate)

### **3. Regulatory body or Authority Having Jurisdiction (AHJ)**

Conduct regulatory body or AHJ reviews and audits to assess adherence to established criteria and maintain proper documentation of reviews and audits. (Analyze)

## **E. Quality monitoring and reporting**

### **1. Acceptance criteria definition and implementation**

Establish criteria for accepting work at various stages, such as mock-up inspection and testing, initial inspection and testing, work-in-process inspection, punch list inspection, and final inspection, testing, and commissioning. Integrate material verification at each stage to assess if materials meet project specifications and quality standards. Apply escalation procedures to address materials that do not meet established acceptance criteria. (Evaluate)

### **2. Reporting and analysis**

Design periodic reports and conduct statistical analyses to identify quality trends and assess waste elimination. (Evaluate)



### **3. Meetings and participation**

Organize pre-inspection meetings that include quality meeting sample agenda items that address key topics, such as upcoming inspections, current quality metrics, recent findings, and open issues. (Evaluate)

### **4. Lessons and improvements**

Incorporate lessons learned from previous projects into the quality monitoring and reporting process. Document and communicate these lessons learned for future projects. Develop strategies to assess and manage quality risks. Engage in root cause analyses and investigations to understand underlying quality issues. Develop quality improvement programs based on identified needs and insights. (Evaluate)

### **5. Levels of commissioning**

Understand and determine when to use the 5-level (factory acceptance test, component verification, system construction, individual system and major equipment operation verification, integrated system testing) and 8-level (preparation, design, pre-construction, construction, commissioning of services, pre-handover, initial occupation, post-occupancy care) commissioning frameworks. (Evaluate)

## **VI. Project Turnover and Closeout (11 Questions)**

### **A. Documentation management**

#### **1. Impact assessment and compliance**

Evaluate the potential impact arising from the demobilization of quality resources. Review and assess inspection and test records related to safety critical equipment to determine if they are compliant with required standards. Confirm how final documentation will be transferred to the client (e.g., digital platforms, electronically, and hard copy). (Evaluate)

#### **2. Required documentation**

Maintain comprehensive documentation throughout the project's duration, including records of all activities and changes. (Apply)

#### **3. Nonconforming work**

Ensure all work not conforming to contract specifications (i.e., punch list) is closed. (Evaluate)

#### **4. Quality deliverables verification**

Verify the completeness of all quality deliverables. (Evaluate)

#### **5. Final certification**

Facilitate the process for obtaining final certification, ensuring inclusion and maintenance of all documentation related to each closeout milestone and stage (e.g., beneficial occupancy / use, substantial completion, and final completion). Use the current version of Issued for Construction (IFCs) documents. (Evaluate)

#### **6. Final turnover and closeout documentation**

Audit the final turnover plan and related closeout documentation, including permit close out, operations and maintenance manuals, as-built drawings, attic stock / spare parts records, commissioning reports, and owner training materials. Confirm all quality inspection and test records are reviewed and validated for fitness for use. (Evaluate)

#### **7. Warranties**

Implement effective communication regarding the warranty program and documentation or warranty work to all relevant stakeholders. (Evaluate)

## VII. Operations and Maintenance (5 Questions)

### A. Sustaining quality requirements

Prepare quality objectives required for operations and maintenance (O&M) based on customer expectations. Understand how in-contract and warranty maintenance programs are used throughout the project lifecycle. Report future O&M inspections and testing strategies needed (e.g., building component health, risk-based) to the design team. (Apply)

### B. Business continuity

Provide inputs for facility shutdown plans, considering both planned (e.g., O&M-required) and unplanned events (e.g., weather or disaster-related incidents). Align the quality plan with the business continuity plan for operational resilience. Apply drills and simulations to test these plans. Monitor the quality-related impacts resulting from shutdowns. (Apply)

## VIII. Quality Manager Skills (22 Questions)

### A. ASQ Code of Ethics

Demonstrate appropriate behaviors and actions that align with the ASQ Code of Ethics. (Analyze)

### B. Stakeholder analysis and alignment

Identify the perspectives, needs, and objectives of various internal and external stakeholders. Integrate collaboration and negotiation techniques to align the organization's strategic objectives and stakeholder expectations. (Apply)

### C. Team building

#### 1. Vision development

Collaborate with stakeholders to adopt quality goals and a clear vision for a team or project. (Apply)

#### 2. Stages of team development

Identify and distinguish between the stages of team development: forming, storming, norming, performing, and adjourning. (Analyze)

#### 3. Effective team dynamics and communication

Employ various communication techniques (e.g., verbal, nonverbal, written, and visual) and active listening. Collaborate with multiple groups (e.g., designers, project management, and craft teams). Implement the Responsible, Accountable, Consulted, Informed (RACI) Matrix to clarify roles and responsibilities and streamline decision-making processes. Understand decision-making pitfalls (e.g., groupthink and power dynamics) to promote healthy team dynamics and achieve project objectives. Resolve conflicts through established procedures. (Apply)

### D. Change management

#### 1. Organizational culture

Define and explain the factors that shape an organization's culture. (Apply)

#### 2. Change management strategies

Analyze and provide input to various change management strategies to overcome organizational roadblocks, adapt to global changes, assess the achieved change levels, and review outcomes for effectiveness. (Analyze)

## **E. Cost of Quality (CoQ)**

### **1. Cost of Quality (CoQ) analysis**

Examine the methods and sources for collecting CoQ data. Interpret the CoQ data to derive meaningful insights. Report and communicate findings from the CoQ data analysis. (Analyze)

### **2. Improvement plans**

Incorporate CoQ as a foundation for improvement methodology, alongside Lean, Six Sigma (e.g., DMAIC), and Deming's System of Profound Knowledge (SoPK). Identify areas for improvement from CoQ data analysis, and participate in the improvement plan to address these, integrating the plan with existing business processes. Evaluate the effectiveness and applicability of CoQ tools and methodologies. (Evaluate)

### **3. Organizational goals**

Assess how CoQ improvement efforts align with organizational goals. Monitor and measure the progress made towards achieving organizational goals. Evaluate the steps taken to achieve organizational goals based on CoQ improvements. (Evaluate)

## **F. Customer satisfaction**

### **1. Customer feedback systems**

Apply feedback collection tools, such listening posts, focus groups, complaint logs, warranty data, surveys, and interviews to capture positive and negative feedback. (Apply)

### **2. Customer value analysis**

Analyze a customer value analysis to determine the financial impact of customer retention and the potential consequences of customer attrition. (Analyze)

### **3. Customer experience enhancement**

Evaluate corrective strategies and proactive methods to enhance customer satisfaction, loyalty, and retention. (Evaluate)

## **G. Quality management tools**

### **1. Quality tools**

Select the appropriate tool and evaluate the output from the seven classic quality tools (Pareto charts, cause and effect diagrams, flowcharts, control charts, check sheets, scatter diagrams, and histograms) as preventive measures, analyze root causes, and problem solve. (Evaluate)

### **2. Learning and best practices analysis**

Incorporate after-action reviews, and root cause analysis (RCA) meetings to critically assess project outcomes and identify lessons learned from all phases of the project, identifying both successes and areas for improvement. Analyze the critical success factors that led to best practices being implemented within the project. Use key performance indicators (KPIs) to systematically track and assess the impact of implemented improvements and evaluate strategies to reinforce and replicate these improvements across future projects. (Evaluate)

### **3. Knowledge management analysis**

Document the strategies and outcomes of knowledge management throughout the project. (Apply)

# 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**

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

### **Understand**

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

### **Apply**

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

### **Analyze**

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**

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

### **Create**

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 is appropriate to examine further or from which supported conclusions can be drawn.