The A**i**C BIM BOK Pocket Guide I

Entry Level
Knowledge, Skills & Abilities

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Entry Level of Performance
Plan It

<u>Organizational mission statement</u> - An organizational mission related to building information modeling is an organization's reason for producing building information models. It should reflect the values and beliefs of top managers in an organization and their implementation of building information models. A mission statement is the broad definition of the organizational mission and its use of BIM. It is sometimes referred to as a creed, purpose, or statement of corporate philosophy and values related to their BIM strategy.

Knowledge Required	Knowledge of overall organizational mission and how BIM will support that mission. Applications and advantages of BIM for organizations. The values of business values of BIM for organizations. Knowledge of overall organization's function, markets and competitive advantages and how BIM will support the intended mission and business goals.
Abilities Required	Ability to understand mission needs. The ability to understand BIM advantages and value.
Skills Required	Writing Skills

<u>BXP Process Mapping</u> - The BIM Execution Plan (BXP) is developed by suppliers, typically pre-contract to address the Employer's Information Requirements (EIR) - and defines how the information modelling aspects of a project will be carried out. Process mapping of the information flows shall be developed for the project and identify all parties involved. While based on generic workflows, each project may be slightly different and those differences shall be noted.

Knowledge Required	Knowledge of BIM process management, BIM requirements, BIM implementation necessities, project supply chain details. Knowledge of BIM execution planning and fundamentals of business process mapping. Knowledge of BIM execution plan and BPMN process mapping, contractual features and procurement strategies
Abilities Required	Ability to understand process mapping.
Skills Required	Writing Skills

BXP: Information Exchange -

The BIM Execution Plan (BXP, BEP or BIMxP) is developed by suppliers - typically pre-contract to address the Employer's Information Requirements (EIR) - and defines how the information modelling aspects of a project will be carried out. Information exchanges shall be identified. While the standard is COBie, it is a data schema and therefore each project will be unique as to what information is exchanged between each party. The authoritative sources for each data element shall be defined.

Knowledge Required	Knowledge of BIM execution planning and information exchanges. Various data and information involved in BIM implementation, types of data and formats of data, parties involved in data and information exchange, interoperability concept. Knowledge of information exchange standards (both proprietary and open standards) and their applicable contexts.
Abilities Required	Ability to understand information exchanges, data and information management, collaboration, converting data to other formats, information modeling.
Skills Required	Skill with BIM tools, collaboration tools, and data repository platforms.

BXP: Goals -

Identifying the aims and objectives for BIM implementation on the project, the appropriate BIM uses, key milestones to achieve, and what measures you can use to demonstrate your progress, based on the project and team characteristic. The BIM Execution Plan (BXP, BEP or BIMxP) is developed by suppliers - typically pre-contract to address the Employer's Information Requirements (EIR) - and defines how the information modelling aspects of a project will be carried out. Goals shall be identified and agreed to by all parties.

Knowledge Required	Knowledge of BIM execution planning, and BPMN process mapping. Knowledge of establishing goal statements (measurable goals). Project goals of using BIM, project deliverables, values of BIM for project deliverables, various BIM tools and capabilities.
Abilities Required	Ability to understand BIM execution planning, organizational mission and business goals.
Skills Required	Skill with BIM tools.

BXP: BIM Usage -

The BIM Execution Plan (BXP, BEP or BIMxP) is developed by suppliers - typically pre-contract to address the Employer's Information Requirements (EIR) - and defines how the information modelling aspects of a project will be carried out. All parties involved with the BIM shall be identified as well as how they will use the BIM shall be documented.

Knowledge Required	Knowledge of BIM execution planning and procurement strategies. Knowledge of BIM use cases, applications and advantages of BIM, and various BIM tools and capabilities.
Abilities Required	Ability to understand BIM uses and associate the use with project specific goals.
Skills Required	Skill with BIM tools.

BXP: Procurement Strategy - The BIM Execution Plan (BXP, BEP or BIMxP) is developed by suppliers - typically pre-contract to address the Employer's Information Requirements (EIR) - and defines how the information modelling aspects of a project will be carried out. The procurement strategy shall be documented for all parties involved.

Knowledge Required Knowledge of BIM execution planning and procurement strategies. BIM contractual frameworks, project integration concept, BIM values for various stakeholders (particular FM and asset management parties), roles and responsibilities associated with BIM-enabled projects.

Abilities Required Ability to understand the association of project procurement strategy with project BIM use. Understanding of national and international BIM guidelines and standards.

Skills Required Skill with BIM tools.

Infrastructure Planning - An infrastructure plan likely involves both BIM and GIS elements and therefore requires understanding of the integration of both aspects over the life cycle of a project.

Knowledge Required Knowledge of infrastructure needs. Knowledge of BIM business benefits and relevant BIM applications in infrastructure projects.

Abilities Required Ability to understand the use of BIM on road, airport and rail projects, and infrastructure procurement planning.

Skills Required Skill with BIM & GIS tools.

Quality Assurance Effort - The effort required to maintain a desired level of quality in a building information model, service, or product, especially by means of attention to every stage of the process of delivery or production.

Knowledge Required Knowledge of quality assurance processes. QA and QC concepts and procedures, BIM advantages and application for QA/QC, LOD concept. Knowledge of model validation, information handover and other quality assurance issues and processes.

Abilities Required Understanding of BIM and the roles and responsibilities within QA processes, with the ability to integrate the QA/QC into a design process based on BIM.

Skills Required Skills with automated model checking, model-checking software, BIM model reviewing.

Benchmarking Practices - A benchmark is a point of reference by which something can be measured. In building information modeling it is the scope of which a model is based upon standard professional practice.

Knowledge Required BIM capability and maturity evaluation tools, BIM performance metrics. Knowledge of benchmarking and metrics

Abilities Required Ability to understand benchmarking strategies, BIM maturity, and BIM performance.

Skills Required Skill with BIM tools and maturity models such as I-CMM.

Facility Management Needs - Use of a building information model during design and construction to understand and evaluate the impact of the completed facility or structure on the multiple disciplines required to ensure functionality of the built environment by integrating people, place, process and technology on the management of the facility once completed.

Knowledge Required Knowledge of facility management needs.

Abilities Required Ability to understand and appreciate FM needs at all phases.

Skills Required Skills using BIM software in the conversion of data to FM platforms.

Life Cycle Assessment - A life-cycle assessment (LCA, also known as life-cycle analysis, ecobalance, and cradle-to-grave analysis) is a technique using a building information model to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling).

Knowledge Required Understands LCA concepts, LCA evaluation, sustainable construction. Knowledge of life cycle assessment of products and facilities.

Abilities Required Ability to understand product analysis, comparison, and results relative to the facility programme and goals.

Skills Required Skill with BIM tools.

Professional Development - Professional development may be used in reference to a wide variety of specialized training for every aspect of a building information model to include formal education, advanced professional learning intended to help managers, project managers, consultants, practitioners, and all others involved to improve their professional knowledge, competence, skill, and effectiveness in the development, management, and implementation of building information modeling in an organization.

Knowledge Required Understands BIM training requirements and professional development requirements across organizations.

Abilities Required Ability to plan BIM training for employees

Skills Required Skills with training and educational material development.

Internal Standards Across the Organization - A BIM manager may be required to identify and implement internal standards to be used throughout an organization. Ideally these will be based on the highest level standards available so as to encourage interoperability with other organizations involved with the development of a building information model. Typically, an international or national standard should be used as the foundation to minimize the interface issues as the project progresses.

Knowledge Required	Knowledge of existing internal standards and sources for organizational standards.
Abilities Required	Ability to understand corporate BIM standards.
Skills Required	Skill with BIM tools.

Develop Guides - The development of a guideline for production of a Building Information Model documenting a process for creating and managing information on a construction project across the project lifecycle.

Knowledge Required	Fundamental understanding of knowledge management in organizations and existing guides.
Abilities Required	Ability to understand future organizational BIM needs and capabilities.
Skills Required	Technical writing.

Building Performance Targets - Specific goals are established for a facilities performance using a building information model. Performance-Based Building Design is an approach to the design of any complexity of building, from single-detached homes up to and including high-rise apartments and office buildings. A building constructed in this way is required to meet certain measurable or predictable performance requirements, such as energy efficiency or seismic load, without a specific prescribed method by which to attain those requirements. This is in contrast to traditional prescribed building codes, which mandate minimum specific construction practices, such as stud size and distance between studs in wooden frame construction. Such an approach provides the freedom to develop tools and methods such as building information modeling to evaluate the entire life cycle of the building process, from the business dealings, to procurement, through construction and the evaluation of results.

Knowledge Required	Understanding of existing BIM capability and maturity evaluation tools, BIM performance metrics.
Abilities Required	Ability to assess maturity and BIM performance using available tools.
Skills Required	Skills with building performance BIM analysis tools and model maturity measurement tools such as I-CMM.

Entry Level of Performance
Coordinate It

Technical Support for Interoperability - The ability to provide the necessary technical understanding, innovation, and support of a building information model to exchange and make use of information from multiple actors in the modeling project.

Knowledge Required	Understands open BIM concept, interoperability principles, various types and formats of data, collaboration concept, and federating techniques. Knowledge of discipline-specific modeling practices; knowledge of trade coordination needs, process and best practices.
Abilities Required	Ability to understands data conversion management, using IFC, BCF and other open standards and exchange formats.
Skills Required	Skill with BIM tools.

Model Coordination - Building Information Model coordination is the process of synchronizing activities of various persons in the organization in order to achieve the goal of an integrated model. It is undertaken at every level of building information model management. It deals with the task of blending efforts from multiple disciplines in order to ensure successful attainment of the BIM objective.

Knowledge Required	Understands model elements, federating techniques, trade coordination needs, processes, and best practices.
Abilities Required	Ability to assist with implementation of comprehensive model coordination plan; ability to manage coordination efforts in a multidisciplinary team.
Skills Required	Skill with BIM coordination tools, collaboration and teamwork.

Pre-Construction Issue Resolution - The act of coordinating the resolution or determining an action, course of action, methods, procedures, and the next steps to take to mitigate an issue using a building information model prior to construction of a structure.

Knowledge Required	Fundamental understanding of preconstruction issues (design decisions and evaluations, value engineering and analysis, scheduling, constructability reviews, costs, permitting, land acquisition, and life-cycle costs, etc.) and their resolution.
Abilities Required	Ability to resolve preconstruction issues with applicable BIM tools and functions.
Skills Required	Skills with applicable BIM tools in preconstruction design review, constructability review, cost estimating, scheduling, team-building, coordination and communication.

Software Version Coordination - Software versioning is a system by which different releases of a particular software program are numbered for both internal use and release designation. This system allows software developers to more easily track changes between versions, and allows customers and users of the software to better recognize updated versions. A building information model typically requires multiple versions of multiple software and the BIM manager must be able to understand the ramifications of the interactions of all these software tools on the model being developed and aggregated.

Knowledge Required   Understands BIM tools used and ramifications of multiple versions integration on aggregated models.

Abilities Required   Ability to assist with software update protocols.

Skills Required   Skills with BIM tools

Understand the Roles of All Phases of the Life Cycle - The understanding of all of the stages of a building information model and the physical product produced from its conception and development to its eventual disposal or demolition.

Knowledge Required   Understands project life cycle phases, project delivery methods, model progression, and LOD.

Abilities Required   Ability to develop phased modeling and coordination plans.

Skills Required   Skills defining LOD requirements and coordination activities.

Entry Level of Performance
Manage It

<u>Model Quality Control</u> - A system of maintaining standards of a building information model by testing a sample of the output against the specification on a continuous or scheduled basis.

    Knowledge Required   Understands quality requirements, accuracy and tolerance details.

    Abilities Required   Ability to plan model control procedures.

    Skills Required   Skill with BIM tools.

<u>Manage BXP</u> - To be in charge of a building information model execution plan and to then administer and run the plan for the life of the BIM project.

    Knowledge Required   Understands BIM execution plan targets and objectives.

    Abilities Required   Ability to facilitate procedures to fulfill BXP requirements.

    Skills Required   Fundamental management skills.

<u>Refine BXP</u> - To continually improve the building information model execution plan and to apply improvements to either the current and/or future building information modeling execution plans.

    Knowledge Required   Understands BIM execution plan targets and objectives.

    Abilities Required   Ability to plan procedures to fulfil BXP requirements.

    Skills Required   Skill with BIM tools.

<u>Model Validation</u> - Validation checks the accuracy of the model's representation of the real system. Model validation is defined to mean "substantiation that a computerized model, within its domain of applicability, possesses a satisfactory range of accuracy consistent with the intended application of the model".

    Knowledge Required   Understands model quality requirements, accuracy and tolerance details.

    Abilities Required   Ability to validate a BIM adheres to standard construction practices for assembly.

    Skills Required   Skill with BIM tools.

Standards Compliance Checking - The process of compliance checking means ensuring the model is conforming to rules, such as a specification, policy, standard or law. Building Information Model compliance checking describes the goal that organizations aspire to achieve in their efforts to ensure that they are aware of and take steps to comply with relevant laws, polices, and regulations.

Knowledge Required	Understands National and International BIM standards requirements, industry and testing standards requirement, building codes and other legal/regulatory requirements.
Abilities Required	Demonstrate an ability to identify standards compliance. Use of national and international BIM and standards.
Skills Required	Checking models for compatibility with defined standards.

Contract Language - Contract language for building information modeling are not static and may change for each project. While certain terms and phrases in a contract have become defined as an industry standard, courts construe many terms in contracts using numerous sources, including the law, conduct of the parties to the contract and other documents besides the contract itself. There are also multiple sources for standard contract language related to BIM.

Knowledge Required	Understands contractual terms related to BIM responsibilities, liabilities and limitations.
Abilities Required	Ability to identify contractual requirements on BIM execution.
Skills Required	Skills with verifying BIM requirements, and project team's responsibilities.

Project Controls -Budgeting/Cost - Project controls are the data gathering, management and analytical processes used to predict, understand and constructively influence the cost outcomes of a building information modeling project or program; through the communication of information in formats that assist effective management and decision making to effectively reduce the overall cost for project completion.

Knowledge Required	Project management and cost knowledge.
Abilities Required	Ability to use BIM for cost control.
Skills Required	Skills with 5D tools and procedures.

Project Controls - Scheduling/Time -
Project controls are the data gathering, management and analytical processes used to predict, understand and constructively influence the completion time of a building information modeling project or program; through the communication of information in formats that assist effective management and decision making to effectively reduce the overall time for project completion.

Knowledge Required   Project management and schedule knowledge

Abilities Required   Ability to use BIM for scheduling.

Skills Required   Skills with 4D tools and procedures.

Project Lifecycle Data Collection - Feedback Loop -
Project lifecycle data collection is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes for the life of a building information modeling project and provide information for future decisions on the same or other building information modeling projects.

Knowledge Required   Understands project lifecycle data use on construction projects.

Abilities Required   Ability to capture lifecycle data.

Skills Required   Skills using a BIM-based portal for all project participants.

Change Management -
Change management is a systematic approach using a BIM to deal with change both from the perspective of an organization and the individual. A somewhat ambiguous term, change management has at least three different aspects, including: adapting to change, controlling change, and effecting change.

Knowledge Required   Understands the fundamentals of change management.

Abilities Required   Ability to assist with changes using BIM.

Skills Required   Skills with BIM tools.

Project Administration -
Overseeing the fulfillment of the responsibilities of all parties involved with a building information model to the contract for construction, for the primary benefit of the owner. In the typical project, construction administration is usually provided by the design professional.

Knowledge Required   Understands the fundamentals of project management.

Abilities Required   Ability to assist with oversight of multiple parties with responsibilities on a construction project.

Skills Required   Skills with BIM tools for project administration.

Manage Information Exchange - Information exchange is an informal term that can either refer to bidirectional information transmission/information transfer in telecommunications and computer science or communication seen from a system-theoretic or information-theoretic point of view.

Knowledge Required Fundamental understanding of various data and information involved in BIM implementation, types of data and format of data, parties involved in data and information exchange, interoperability concept, open formats of data, and COBie.

Abilities Required The ability to understand, and control the exchange of information in BIM.

Skills Required Skill with conversion of data among various software and BIM tools, and resolving data conversion issues.

Pre-Construction Issue Resolution - The act of coordinating the resolution or determining an action, course of action, methods, procedures, and the next steps to take to mitigate an issue using a building information model prior to construction of a structure.

Knowledge Required Understands potential pre-construction issues.

Abilities Required Ability to plan BIM-based procedures for resolving pre-construction issues.

Skills Required Automated model checking, model-checking software, BIM model reviewing.

Professional Ethics - Professional ethics are rules of conduct for a specific profession and are generally drawn up by members of the professional board. They enumerate standards and rules of conduct that members are expected and required to meet. Professional ethics for BIM are currently emerging and must be understood.

Knowledge Required Knowledge of professional ethics.

Abilities Required Ability to make project related decisions that are ethical.

Skills Required Skills to operate in an ethical manner.

Entry Level of Performance
Do It

<u>Individual Effort</u> - A personal vigorous or determined attempt to complete a building information modeling task.

Knowledge Required	Knowledge of entry level BIM position responsibilities and fundamental BIM use cases.
Abilities Required	Perform fundamental BIM authoring and analyzing tasks essential to job functions with continuous improvement.
Skills Required	Skill with BIM tools for project authoring, analyzing, visualization, documentation generation, etc.

<u>Understands Just Your Own Model</u> - Building Information Modeling is the human activity of using BIM software and other related software, hardware and technologies to create, and use, a building information model for one specific discipline for which you have knowledge.

Knowledge Required	Understands disciplinary-specific BIM use cases and essential design/construction "information" embedded in BIM.
Abilities Required	Ability to Identify, extract, and exchange information embedded in BIM.
Skills Required	Skill with model view definition, model manipulation and model information management.

<u>Ability to Build a Model</u> - Building Information Modeling is the human activity of using BIM software and other related software, hardware and technologies to create, use, and aggregate a building information model.

Knowledge Required	Knowledge of 3D modeling and disciplinary specific modeling.
Abilities Required	Ability to create disciplinary-specific building information model.
Skills Required	Skills with BIM authoring tools.

Aggregate a Model -

An information model in software engineering is a representation of concepts and the relationships, constraints, rules, and operations to specify data semantics for a chosen domain of discourse. Typically, it specifies relations between various project aspects such as architectural, structural, mechanical, and electrical engineering sub-models, but may also include relations with individual things.

Knowledge Required Knowledge of concurrent modeling and model aggregation process.

Abilities Required Ability to synchronize and federate a model.

Skills Required Skill with multidisciplinary model authoring, exchange and management.

Software Usage -

The application of computer software to Building Information Modeling, as part of a computer system that consists of data or computer instructions, in contrast to the physical hardware from which the system is built. In computer science and software engineering, computer software is all information processed by computer systems, programs and data.

Knowledge Required Knowledge of corporate BIM software tools and use.

Abilities Required Ability to utilize discipline-specific and job task-driven BIM software packages.

Skills Required Skill with BIM tools.

Solving Problems and Gaining Knowledge -

The process of finding solutions to difficult or complex issues and using a building information model to resolve even more complex follow-on model related events or issues.

Knowledge Required Knowledge of identified obstacles, barriers and issues related to BIM execution.

Abilities Required Ability to identify contextual issues in BIM execution.

Skills Required Skills to use BIM tools for problem-solving.

Estimating -

Construction estimating in this instance is the application of computer software using a BIM as the input source for contractors to estimate construction costs for a specific project. An estimator will typically use estimating software to estimate their bid price for a project, which will ultimately become part of a resulting construction contract.

Knowledge Required Understands the relationship between QTO/cost estimating, model preparation, BIM data extraction, and LOD.

Abilities Required Ability to develop and prepare model for QTO and estimating purposes.

Skills Required Skill with model data extraction and management.

Site Logistics - Logistics is defined as a business planning framework for the management of material, service, information as it relates to a building site. It includes the increasingly complex mapping of building information modeling to other forms of information, communication and control systems required in today's construction environment.

Knowledge Required	Knowledge of site logistics and mobilization.
Abilities Required	Ability to develop site logistics plan with scheduling and timeline evolution.
Skills Required	Skill with site logistics management, timeline simulation and applicable BIM tools.

List of BIM Uses - A BIM Use is defined as a method of applying Building Information Modeling during a facility's lifecycle to achieve one or more specific objectives.

Knowledge Required	Knowledge of BIM use cases.
Abilities Required	Ability to interpret, compare, and evaluate BIM uses based upon business goals, client's project requirements.
Skills Required	Skill with applicable and use case specific BIM tools.

Knowledge of Programing - The basic knowledge of a unique vocabulary and set of rules for writing computer programs related to building information modeling and its supporting capabilities.

Knowledge Required	Knowledge of programming related to BIM function and application.
Abilities Required	Ability to create context-specific BIM functions and applications.
Skills Required	Skill with APIs of applicable BIM tools and major scripting language for BIM plug-in/add-on development.

Technical Writing - Technical writing is any written form of writing or drafting technical communication used in a variety of technical and occupational fields, such as building information modeling and its relationship to architecture, information science, engineering, robotics, and finance.

Knowledge Required	Knowledge of terminology, nomenclature, standards, and best practices of BIM
Abilities Required	Ability to create written communication relevant to BIM in a professional manner.
Skills Required	BIM based technical writing skills.