BIM Checklist#

Introduction

This Building Information Modeling (BIM) Checklist is intended to be used as a guide for project stakeholders who are looking to implement BIM/VDC in a design-build project. Since integration and collaboration are essential to design-build project delivery, this checklist helps users determine what BIM capabilities should be considered for all major project phases. The checklist addresses how each BIM capability may enable each of the following top 10 Design-Build Benefits on any given project.

Singular Responsibility. With both design and construction in the hands of a single entity, there is a single point of responsibility for quality, cost and schedule adherence. The purpose of a singular entity aligns with the design-build core concept of streamlining efforts, minimizing redundancy and latency and maintaining accountability for all stakeholders.

Quality. The greater responsibility implicit in design-build serves as a motivation for high quality and the proper performance of process and building systems. Design-build equals or improves the quality over design-bid-build or CMR projects.

Alignment of Design and Construction Professionals. Design and construction professionals are able to quickly and proactively approach scope changes since the team is aligned more closely. Also, infusion of construction knowledge into a design approach can result in a highly efficient design at early stages that carries through the construction efforts with regard to constructability, phasing and coordination.

Cost Savings. In order to determine best value through planning, design and construction personnel, working as a team, evaluate scope, size, alternative materials and methods efficiently and accurately, resulting in cost analysis, certainty and potential for reduced cost.

Time Savings. Overlapping of design and construction can significantly reduce total project schedule, thereby accelerating speed of product to market. With input and visual validation coming from both the design and construction members of the design-build team, BIM further allows for team members to look at solutions to reduce schedule durations and efficiency.

Potential for Reduced Administrative Burden. Under a streamlined project delivery process, the potential exists for design-build to reduce the owner's administrative burden.

Early Knowledge of Firm Costs. Because the entity responsible for design is simultaneously estimating construction costs – and can accurately conceptualize the completed project – guaranteed construction costs are known far sooner than traditionally possible. All depends on whether the project is designer-led or constructor-led. The design-build team is responsible for estimating and schedule development.

Lower claims and litigation. Data from some of the largest professional liability insurers in the country say that the number of claims in design-build is far fewer than with other delivery methods.

Risk Management. Quality, cost and schedule expectations are clearly defined and appropriately balanced, with individual risks managed by the party best positioned to manage that risk. Two parties, not three as with design bid-build, share risks.

Innovation. Design-build is itself an innovative way of delivering projects. This checklist aims to further this foundation of innovation by allowing for new and innovative tools and technologies to be woven into the BIM process as it relates to design-build delivery. It is the intent of this guide to encourage innovation, including new workflows and technologies to be effectively planned for, delivered and evaluated moving forward.

BIM Checklist

Project Data

Project Name .....

Project Number .....

Project Manager .....

BIM Checklist Review Dates

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Action Items

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Project Objective	Responsibility	Complete	BIM Capabilities	Description	Singular Responsibility	Quality	Alignment Professionals	Cost Savings	Time Savings	Reduced Administrative Burden	Early Knowledge of Firm Costs	Lower claims and litigation	Risk Management	Innovation
			Virtual Design and Construction Planning											
			Staff skills	Discuss and define experience, capabilities, proficiencies and software experiences. Partner individual team strengths with relevant experience and identify any areas that lack in capabilities.										
			Software applications in use	Software applications that are currently in use by each team member and which software is used more prevalently in-house with better end results and products.										
			Model, drawing and data exchange among team members	Define software applications that are to be used and create a plan that maximizes interoperability and data exchange between software systems. Define any special workflows or connective software that might better enable the team to collaborate.										
			Computer hardware requirements	Computer requirements for users machines to properly operate the software being utilized, network connectivity and any other applications the team may be using.										
			Tracking progress of model versus drawing production	Crosscheck model progress versus 2D drawing progress. Evaluate level of details in model are adequate for each team member's use.										
			Discipline coordination	Define roles, workflows, reviews, changes and verification of all testing processes. Determine modeling effectiveness in regard to model input, time, effort and schedule.										

			Data use for construction, operations and maintenance	Establish any and all data required by project stakeholders and determine when and where the information is to be shared, extracted, analyzed or resolved over the course of the project's schedule.										
			Working with the Owner, review and approval deliverables	Develop a schedule and deliverables that define when the Owner is to receive project information, acceptable review periods and when to show revisions made.										
			Test data exchange capability	Test data interchange of each team members' file types via the chosen project medium (FTP, file sharing site, hard copy, etc…) for all required tasks such as document creation, specification generation, cost generation, clash detection, etc..										
			Reporting capabilities	Determine how results are to be distributed in regard to file type, medium and readability.										
			Meeting protocol (technology/hardware)	Define meeting medium (online meetings, co-location, weekly meeting, etc..) and verify the ability of project team to participate with all necessary software and hardware requirements.										
			Model Scope (design/construction/schedule/etc.)	Building model scope definitions, level of detail determination and required delivery dates for all model efforts, throughout the project schedule.										
			Downstream operability (fabrication/etc.)	Verify with all stakeholders any opportunities to share file types that may be leveraged downstream for all users, including fabricators, installers and craftsmen.										
			BIM Champion	Appoint a single source of responsibility for the coordination of BIM and related BIM efforts for the project.										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											
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			Conceptualization											
			Program analysis - building block planning and mass modeling, space program reports	Building program defined and documented, use of 3D building massing model of color coded spaces to visualize functional layout, evaluate organizational, departmental and rooms relationships, use of space utilization reports to compare as-designed versus as-programmed										
			Land use analysis - ownership, zoning, environmental areas, utility locations	Geospatial mapping application used to document and visualize land use to assist with site master planning, site data includes aerial photography, cadastral data, existing utilities, land features, etc.										
			Site logistics study and impact	Geospatial and civil applications used to strategize site layout, crane placement, temporary structures location, use of schedule simulation to evaluate transitions between phases of work, calculate and optimize earth movement										
			Civil site evaluation - building location and preliminary grading	Existing site survey data used to develop a digital terrain model, civil application used to evaluate multiple alternatives for building locations, parking areas and road entry/exit from site										
			Functional use per sq. ft. quantity take-off and cost estimating	3D massing and spaces model(s) used to visualize and report on space square footage and categorization for calculating costs per square										
			Building systems construction schedule simulation	Development of schematic design model(s) for major building systems layouts (i.e. structural, architectural, mechanical systems, plumbing) for system coordination, clash detection and preliminary construction sequencing simulation										

			Virtual mock-ups (preliminary level)	3D design model for visualizing building components, use for evaluating material use, construction assembly, energy analysis, lighting analysis, acoustics, etc.										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											
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			Criteria Design											
			Civil site evaluation - preliminary cut and fill calculations	Existing site survey data used to develop a digital terrain model, locate building pad, schematic parking areas and storm water control (i.e. swales, berms, ponds) defined, model used to calculate and optimize earth movement										
			Utilities design - capacity calculations (storm water / sewer / water / etc.)	Existing site utilities documented, preliminary site evaluation used to calculate storm water control requirements, preliminary building and site amenities used to calculate sewer, potable water, electrical and communications requirements, model used to size preliminary utilities and document proposed location										
			Utilities design- capacity calculations (water/wastewater treatment facilities)	For industrial or municipal water and wastewater projects, capacity calculations can be performed to verify process piping systems meet performance and code requirements.										
			Architectural space program - validation reports	Building program defined and documented, space management tools used to define and report on spaces in model(s) (i.e. total building, departmental, rooms, gross vs. net vs. useable) model reports used to compare as-designed against as-programmed to confirm that the design meets owner program requirements										
			Design criteria program - validation reports	Models, drawings and reports used by each discipline lead to ensure that the criteria design is satisfying the overall building program and design intent										

			Architectural envelope - generative design alternative evaluation	Building form and exterior skin (i.e. opaque walls, openings, fenestrations) defined using parametric modeling tools to allow for quick iterative design studies										
			MEP major systems layout and coordination - clash detection	Large equipment identified and located in model, large duct runs, pipes, electrical conduit located for systems coordination and clash detection										
			Trade package quantity take-off and cost estimating	Model visualization and reports from preliminary civil work, building MEP systems layout, space usage definitions, surface area for exterior cladding used by design team for preliminary cost estimating										
			Design information to verify design is aligned with budget	All discipline model reports for cost estimating rolled-up to project level to compare as-designed costs with owner project budget										
			LEED - data and documentation requirements	Design components tagged in model for identification of which LEED credit(s) it relates to, model reports to provide tracking of LEED credits under consideration and potential documentation for submittal										
			Design and constructability review	Models, drawings and reports used to discuss with design and contracting team methods of construction, procurement strategy, sequencing of construction, site management, etc.										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											
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			Detailed Design											
			Civil grading (cut and fill, storm water retention calculations)	Models, drawings and surveys used to generate information about the site. Including soil conditions, terrain, water conditions, protected areas and other site and GIS information. Model can be used to generate earthwork calculations and a firm cost estimate.										
			Structural analysis - member sizing, connection detailing, ID tagging information	Structural engineering information in the form of embedded model component information, 3D fabrication files and any other associated and relevant information associated with the design, including RFID tags, barcodes or other identifying information.										
			Interiors - furniture, fixture and equipment identification and inventory reports	Interior and finish information in the form of embedded model component information, 3D fabrication files and any other associated and relevant information associated with the design, including RFID tags, barcodes or other identifying information.										
			Energy simulation - heating and cooling load calculations	Information, simulations and reports generated from a computer based performance simulation for energy use, collection or distribution.										
			Lighting analysis - foot candle per sq.ft. requirements calculations	Information, simulations and reports generated from a computer based performance simulation for lighting use, collection or distribution.										
			Mechanical airflow - CFM per sq.ft. requirements calculations	Information, simulations and reports generated from a computer based performance simulation for mechanical and equipment use, collection or distribution.										

			Building systems coordination - clash detection	Information, simulations and reports generated from a computer based simulation for the collision, clearance or appearance (4D) of 3D or BIM associated objects against other objects in a composite model.										
			Detailed quantity take-off and cost estimating	Information, simulations and reports generated from a computer generated, model based quantity and system takeoff that is linked or exported to a project estimate.										
			Drawing production - plans, sections, elevations extracted from model	All relevant 2D and 3D model views necessary to generate construction documents such as plans, elevations, sections, details and 3D views										
			Constructability review	Information, simulations and reports generated from a computer based construction model that test, analyze and verify the constructability of a building and its component systems Included but not limited to: clash detection, schedule simulations (4D), safety, budget, and resource availability.										
			Testing, startup and commissioning provisions	Information, simulations and reports generated from a computer model based BIM or 3D file that shows how a designed system should perform prior to installation. Verification of this information available afterwards for crosschecking and that anticipated distribution, return and flow of systems performance is met or exceeded.										
			Initial schedule simulation resulting from detailed design	Simulation video, file or animation that communicates the order of physical construction and appearance of objects and activities from a computer based BIM or 3D file based on schedule information.										
			Model handoff- from design to construction	Transition of the design LOD model generated by the AE team to the subcontractor, fabricator or installer (if required).										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											

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			Implementation Documents											
			Architectural - door, opening, room schedules reports	Design intent is conveyed through information and reports generated from a computer based construction model including architectural information in the form of embedded model component information, 3D fabrication files and any other associated and relevant information associated with the design, including RFID tags, barcodes or other identifying information. Generated reports augment the model in order to substantially reduce the shop drawing process OR create a synchronized model for use in fabrication or installation purposes including use of: clash detection, schedule simulations (4D), safety, budget, and resource availability.										
			Interiors - room and finish schedules reports	Design intent is conveyed through information and reports generated from a computer based construction model including architectural information in the form of embedded model component information, schedules and any other associated and relevant information associated with the design, including RFID tags, barcodes or other identifying information. Generated reports reduce the shop drawing process OR create a synchronized model for use in fabrication or installation purposes including use of: schedule simulations (4D), safety, budget, and resource availability.										

			Mechanical - device schedules reports	Design intent is conveyed through information and reports generated from a computer based construction model containing mechanical (including process mechanical equipment for industrial or municipal type projects) information in the form of embedded model component information, schedules and any other associated and relevant information associated with the design intent. Generated reports reduce the shop drawing process OR create a synchronized model for use in fabrication or installation purposes including use of: clash detection, schedule simulations (4D), safety, budget, and resource availability.										
			Electrical - fixture schedules reports	Design intent is conveyed through information and reports generated from a computer based construction model containing electrical information in the form of embedded model component information, schedules and any other associated and relevant information associated with the design intent. Generated reports reduce the shop drawing process OR create a synchronized model for use in fabrication or installation purposes including use of: clash detection, schedule simulations (4D), safety, budget, and resource availability.										
			Quality control- verify model level of detail	Information, simulations and reports generated from a computer based construction model that test, analyze and verify the constructability of a building and its component systems Included but not limited to: clash detection, schedule simulations (4D), safety, budget, and resource availability. Reports generated reflect the design intent and thus should reduce the shop drawing process through a higher level of model detail for permitting and financing										

			LEED - data capture and reporting	Information, simulations and reports generated from a computer based construction model that test, analyze and verify the constructability of a building and its component systems. Reports are able to be uploaded to separate software systems able to calculate LEED calculations and level of compliance.										
			Construction Drawing Extraction	Information, simulations and reports generated from a computer based construction model that convey design intent of a building and its component systems. The construction model will thus be augmented by generated reports for extraction of the construction documents. Reports generated reflect the design intent and thus should reduce the shop drawing process through a higher level of model detail for construction permitting and financing										
			Contract documents format	Reports generated from a computer based construction model that convey design intent of a building and its component systems should be both narrative for use by outside parties not involved in the development of the model. Contract documents thus visualize the project.										
			Implementation documents	Documents include information for procurement, assembly, layout, detailed scheduling, procedural information (testing, commissioning), safety, and legal requirements.										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											
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			Agency Approval Buyout											
			Occupancy - space use and area calculations	The model possesses the ability to provide information and calculations through databases which streamline review of building code and regulations. Software can use the model to generate criteria analyses and validate design intent.										
			Energy compliance - ASHRAE 90.1	The model possesses the ability to provide information and calculations through databases which streamline review of building code and regulations. Software can use the model to generate criteria analyses and validate design intent.										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											
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			Construction											
			Develop architectural, MEP, and structural construction models	Using BIM as a design tool feeds directly into one of the main benefits of Design-Build, the ability to align the design and construction professionals. BIM fully enhances the architect or designer's ability to accurately design a project through a model that will represent all details and information for construction. This BIM capability applies to the architectural, MEP, and structural model.										
			Develop steel detailing model	Because the structural discipline drives the construction schedule, by having a BIM model, the design-builder can generate steel detailing information and begin early fabrication of the structural steel even when the overall structural steel design is not complete.										
			Conduct coordination meetings	Coordination meetings are the core of the design-build collaboration process. Through these meetings, designer and constructors will complete the design model to establish a final for construction model.										
			Develop quantity take off	Specialized quantity takeoff tools include specific features that link directly to items and assemblies, and create visual takeoff diagrams. Use BIM tools that produce quantities from the design model to assemblies setup by estimating software in order to develop the cost estimate.										

			Link construction model to estimate	Use BIM software to get quantities of materials (take into account unusual structural assemblies). Link BIM to estimating software and back to the model in order to update the model data to include cost associated with quantities.										
			Link construction model to schedule	If alignment of design and construction professionals through BIM is one of the most powerful benefits when delivering a DB project, increasing construction communication and efficiency through a 4D model is probably the 2nd most powerful benefit. Converting the 3D model into a 4D model allows schedulers of a DB team to visually plan and communicate activities in the context of space and time.										
			Civil grading - digital data transfer	The digital civil grading model can be transferred to the design-builder and pertinent subcontractors for construction and coordination purposes, such as excavation plans, underground utility coordination, and storm water compliance.										
			Digital Data Transfer-Product Preassembly and Prefabrication	BIM VDC is capable of producing digital data that can be utilized for preassembly and prefabrication of structural steel, precast concrete, MEP, and architectural facades. As BIM VDC expands its interoperability capabilities, additional prefabrication opportunities could be captured. BIM VDC allows the design-builder to capitalize on these preassembly/prefabrication opportunities with greater success. These opportunities will enhance the design-builder's quality, alignment of design and construction, cost savings, and more important of all time savings.										
			Material procurement - detailed systems quantity take-off	Many BIM tools provide simple functions to query and count specific types of components, blocks, or other entities.										
			Safety planning - working orientation	A visual model allows teams to assess conditions and identify unsafe areas before the team is on the field.										

			Construction sequencing - schedule simulation	Use of the 4D model helps mitigate issues associated with schedule misinterpretation through enhanced visualization by linking the schedule to the virtual construction. This 4D animation will enable the DB team to increase visualization and schedule accuracy to then develop an optimized construction sequence work plan.										
			As-construction documentation - updated model	Considering the design may not be complete at the start of construction, the BIM model will allow for the DB to document all construction work instantaneously therefore reducing inaccurate post-construction documentation.										
			Documentation - digital copies of operations manuals, warranties	By updating the BIM model with all equipment information such as OHM data and warranties, the DB can deliver all as-built and any other pertinent information in a final BIM model for use by the Owner.										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											
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			Closeout											
			Space management - reports	Space components that define space boundaries can be used. Facility owners will be able to confirm the space anticipated during virtual design and modeling. This information will also allow Owners to use the model for future remodeling or expansion of facilities.										
			Asset management - reports	Reduction in time and effort to produce and update the facility management database can be achieved by using a BIM model the DB team can customize to Owner's needs.										
			IT infrastructure management - reports											
			Operations and maintenance - equipment reports	Startup and commissioning reports can be incorporated into the model so that the Owner or FM administrator can use the information for operations and maintenance.										
			Develop/Update as-built model	Documenting of all changes after project completion which will facilitate information for future expansion or remodeling projects by the Owner.										
			BIM Punch List	The design-builder may choose to use the model database to keep track of all punch list items and coordinate with subcontractors during weekly project meetings.										
			Project Archiving	Owner handoff for the model										
			Simulated Performance vs. Actual Performance	The designer will have the opportunity to prove the actual performance vs. simulated performance with the intent to communicate and document Owner's requirements and expectations were met.										

			Owner BIM closeout meeting and training	The BIM closeout model will allow the design-builder to present the "as-built" model to the Owner with the intent to communicate actual construction. Owners will also be able to perform all startup training, and any future training, by utilizing the model.										
			Customization into FM Software	When required by the Owner, the design-builder will merge and link model with existing operations software. This is a final step in the BIM model closeout and handoff with the intent to have an updated FM model that facilities operators will use for startup, commissioning, and operation.										
			Laser Scanning	Part of digital as-builts, the DB can deliver a more accurate update of the facility construction as an alternative to manually updating the BIM model throughout construction.										
			Building Automation Testing System	Link the BIM model database to FM software to setup automation of the Owner's system										
			Other BIM Capabilities (Open to other capabilities that derive from new BIM technology, deliverable, or strategy)											

This checklist is not intended to be definitive and all-inclusive. The checklist represents the current state of BIM/VDC capabilities and how each is integrated and adopted by project stakeholders in design-build project delivery. It is DBIA's expectation that both project owners and practitioners will provide feedback with the intent to update and improve the checklist periodically to reflect current BIM advances and design-build best practices. Please contact DBIA to submit formal comments or questions concerning this checklist.