BIM for Infrastructure Execution Plan Template

Version [0.0]

For [PROJECT TITLE]

Developed by [COMPANY NAME]






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Section 1:
BIM for Infrastructure Project Execution Plan Template Introduction

Building Information Modeling (BIM) for Infrastructure or Civil Information Modeling (CIM) is the enterprise-wide approach to delivering value-based, competitive, profitable solutions on projects using 3D models to manage data through the life of the project, from planning, through design, construction and operations.

This execution plan is a living guidance document developed specifically for this project to define CIM uses, process for executing each use, roles and responsibilities, specific technology requirements and deliverables.

The execution plan was developed to provide minimum modeling requirements related to the content and the accuracy of the design elements to be created when authoring infrastructure models for:

- Roadway
- Bridge
- Water & wastewater
- Ports & waterways
- And, aviation projects.

In addition, the plan outlines the project management considerations when developing individual project requirements. Engineers and Contractors are expected to follow the minimum requirements herein; and consult other State DOT standards and specifications when developing digital information for highway and bridge construction.

NOTE: To successfully implement CIM, the team will coordinate the requirements of this document with the State DOT/Facility Owner Project standards and the project management plan for consistency.

Section 2:
Project Information

NOTE: If this information is included in the project management plan provide a link below. Information only needs to be duplicated here if a BIM/CIM Execution Plan is required as a contract submittal.

Section 2.1: Project Basics

NAME	VALUE
Project Owner	
Project Name	
Project Location/address	
Contract Type/Delivery Method	
Brief Project Description	
Additional Project Information	
Lead Design Consultant	
Subconsultant	
Subconsultant	
General Contractor	
Subcontractor	
Subcontractor	
Specialty Suppliers/Vendors	

Section 2.2: Project Numbers

PROJECT INFORMATION	NUMBER
Solicitation Number	
Project Control Number	
District Number	

Section 2.3: Project Schedule/Phases/Milestones

PROJECT STAGE / MILESTONE		ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
DESIGN STAGE				
Design Model	Project Planning (LOD 100-200)			
	Preliminary Design (LOD 200-300)			
	Final Design (LOD 300)			
CONSTRUCTION STAGE				
Construction Model	Construction Delivery (LOD 400)			
	Construction Completion (LOD 500)			
OPERATIONS & MAINTENANCE STAGE				
Asset Model	Turnover (LOD 500)			
	Implementation (LOD 500)			

Section 3:
Project Contacts

These are the primary management and technical contacts. These contacts should be used to seek immediate resolution of project coordination issues.

NOTE: If this information is included in the project management plan provide a link below. Information only needs to be duplicated here if a BIM/CIM Execution Plan is required as a project submittal.

Section 3.1: Project Contacts

ROLE	ORGANIZATION	NAME	EMAIL	TIME ZONE	PHONE
Project Manager					
Lead Project Integrator					
Lead QA/QC					
DOT CIM Representative					

Section 3.2: Design Team Project Contacts

ROLE	ORGANIZATION	NAME	EMAIL	TIME ZONE	PHONE
Project Manager					
Lead Project Integrator					
Lead QA/QC					
CIM Manager(s)					
BIM Manager(s)					
Consultant #1 Discipline Lead					
Consultant #2 Discipline Lead					
Other Project Roles					

Section 3.3: Construction Team Project Contacts

ROLE	ORGANIZATION	NAME	EMAIL	TIME ZONE	PHONE
Project Manager					
Lead Project Integrator					
Lead QA/QC					
CIM Manager(s)					
BIM Manager(s)					

Section 4:
Project Goals / CIM Uses

The primary CIM uses expected to be utilized on this project are described in the following table. After careful consideration the project team has decided on a number of CIM uses on the project. These uses are based on what stage of the project they are to be completely implemented.

NOTE: Only the uses checked are being performed on this project. Any use that is required by contract should be highlighted yellow and marked with an (X).

Section 4.1: Uses by Project Phase

	PLANNING		DESIGN		CONSTRUCT		OPERATION
	Existing Conditions		Existing Conditions		Existing Conditions		As-Built Record Modeling
	Design Authoring		Design Authoring		Construction Authoring		Operation Authoring
	Cost Estimation		Cost Estimation		Cost Estimation		Asset Management
	Constructability Review		Constructability Review		Constructability Review		Maintenance Scheduling
	Programming		Design Coordination		3D Coordination		Building System Analysis
	Phase Planning		Drawing Production		3D Control & Planning		Space Management
	Site Analysis		Structural Analysis		As-Built Record Modeling		Disaster Planning
			Lighting Analysis				
			Energy Analysis				
			Mechanical Analysis				
			Sound Analysis				
			Code Validation				

The general description of each use for this project is outlined in the following table.
NOTE: The below descriptions are general. Project planning team shall refine each use description below to be project specific including the benefit statement of how the Model and Facility Data are leveraged to maximize project value (e.g. design alternatives, life-cycle analysis, scheduling, estimating, material selection, pre-fabrication opportunities, site placement, etc.)

Section 4.2: Use Descriptions

CIM USE	PHASE	DESCRIPTION
Existing Conditions	Planning Design Construction Operation	The objective is to use the appropriate field technologies to accurately capture existing site conditions (above and below ground) before the commencement of design/construction services. These will include traditional site survey, 3D laser scanning (Mobile and/or Static), UAS/Drone Mapping, Ground Penetrating Radar (GPR) and/or other field investigation technologies to efficiently capture site conditions. The benefit is to eliminate unknown site conditions and to leverage the existing conditions model during the design authoring, drawing production and design coordination phases to better integrate with the existing site.
Design Authoring	Design	The objective is to use appropriate software technologies to Author 3D models. Model Elements/Systems will be developed to an upper bound level of development (LOD) of [300][XXX] as defined by [FHWA][BimForm][AIA][NAVFAC][USACE][GSA]. Design team leads will use professional judgment/discretion as to what elements/systems are modeled and what LOD Elements/Systems are modeled to. The Elements/Systems and LOD will be chosen to provide a coordinated model based on what is needed for intra- and inter-disciplinary design. The required design criteria and data standards will be built into the model as needed for the CIM uses listed herein. The benefit is to reduce field conflicts during construction, less rework, fewer RFIs, improved confidence and pricing of constriction and improved interdisciplinary collaboration. NOTE: Select applicable LOD and reference definition. Standard is to develop the model elements to an upper limit of LOD 300 during Design. The LOD of each element/system should be coordinated with the Design team lead and modeler to confirm the value added to the project, unless specifically prescribed in RFP documents. Higher LOD should be coordinated with RFP requirements. Where required by contract a Model Development Specification/Content Plan table will be filled out to provide explicit direct on element development.
Cost Estimation	Planning Design Construction	The objective is to use XXX software to perform Quantity Take-off to accurately capture project quantities for cost estimating. Estimating staff will leverage the models to extract quantity data to either validate manual quantities and/or use to generate total construction costs. The benefit is to reduce the time needed to perform quantity take-off and validate manual quantity take-off information to create more accurate Preliminary and Final estimates.

Constructability Review	Planning Design Construction	The objective is to involve Construction and Asset Management staff in reviewing the Design at identified milestones to provide constructability and operability feedback prior to submission of deliverables to [Client]. In addition to a traditional page turn review, the team will leverage Trimble Quadri and/or other software tools to virtually walk through the model, provide feedback and save views with the feedback comments to Design staff. The benefit is to correct constructability issues during each phase of design to reduce overall risk to the project during final design phases and construction.
Drawing Production	Planning Design	The objective is to develop 2D contract drawings from the 3D models generated during the Design Authoring phase. The 3D model will be directly linked to the software used to develop the 2D drawings, and at submission milestones, the 3D Model and 2D drawing packages will be provided and match one another. Embedded information in the model shall be used to develop schedules and base quantities. Where applicable, the software used during design authoring shall be utilized. The benefit to this process will allow for more efficient development of production drawings, schedules and details, and subsequent updates to the drawings as the design progresses. NOTE: Additional data in the model can be used for other drawing production uses such as quantity take offs, etc. These uses shall be coordinated with the project team.
Design Coordination	Planning Design	The objective of the design coordination is to create a federated model(s) in a Common Data Environment of all disciplines for coordination review, constructability reviews, and clash detection. During the clash detection conflicts between 3D model elements shall be identified and then coordinated to be resolved or accepted based on the discipline presentence order defined in section XX. The appropriate software shall be selected and is outlined in section XX. The benefit is to reduce field conflicts during construction, less rework, fewer RFIs, improved confidence and pricing of constriction and improved interdisciplinary collaboration.
Phase Planning	Planning Design Construction	The objective is to use 4D Phase planning to connect the model and project schedule to visualize the project construction sequence. Project staff will link the scheduled activities to the 3D model to create a simulation of the planned construction activities and make improvements as the design progresses towards completion. The benefit is to visualize the construction sequence to better communicate the critical path of the schedule to project stakeholders.

Construction Authoring	Construction	The objective is to have the General Contractor and Trade partners develop LOD 400 models during Pre-Construction. Trade contractors will use their preferred software to author fabrication level models to the level of detail needed to perform field installation. The benefit is to leverage these models to perform 3D Coordination, 3D Control & Planning and Record Modeling during the construction phase to better coordinate field activities by resolving conflicts prior to beginning construction.
3D Coordination	Construction	The objective is to use the construction models to perform coordination activities between each trade. The project team will use XXX Software to perform clash detection between each trade contractor model and resolve the conflicts prior to commencement of field installation. The benefit is to leverage the construction models to perform coordination activities prior to field activities to eliminate or reduce rework during construction.
3D Control and Planning	Construction	The objective is to use the construction models to perform Quality Assurance to validate the layout and placement of physical elements relative to the coordinated virtual model. The project team will use the hardware listed in table 7.2 to construct and install elements, these will then be validated in Trimble Business Center software to perform the necessary QA checks. The benefit is to both validate elements as they are constructed in the field and make adjustments to elements if they are found to be in the incorrect position, ultimately building the project to plan.
As-Built Record Modeling	Construction Operation	The objective is to use the design and construction models to produce the final record model and record drawings at the completion of construction. The team will leverage the proper combination of software tools to track and manage differences between the design and construction models to develop the record documentation as construction progresses. The benefit is a reduction in hours to complete record documentation and other closeout activities.

Section 5:
Collaboration Procedures

The project team shall collaborate effectively using the 3D model to complete the objectives outlined in Sections 4 6. Collaboration activities will occur at each phase of the project with key project participants. The scope and scheduling of the activities are selected to provide value to the project. The 3D model(s) or products from the model will be utilized to facilitate the collaboration activities.

Section 5.1: Collaboration Plan

PLANNING PHASE				
ACTIVITY	**REQUIRED PER CONTRACT**	**FREQUENCY**	**LOCATION**	**RESPONSIBILITY**
CIM Kick-off Meeting	Yes	Once	Remote Attendance	CIM Task Leads
DESIGN PHASE				
ACTIVITY	**REQUIRED PER CONTRACT**	**FREQUENCY**	**LOCATION**	**RESPONSIBILITY**
CONSTRUCTION PHASE				
ACTIVITY	**REQUIRED PER CONTRACT**	**FREQUENCY**	**LOCATION**	**RESPONSIBILITY**
OPERATIONS PHASE				
ACTIVITY	**REQUIRED PER CONTRACT**	**FREQUENCY**	**LOCATION**	**RESPONSIBILITY**

Section 6:
Quality Assurance and Control

Section 6.1: Overall Strategy for Quality Control and Assurance

Quality Control and Assurance strategies seek to prevent, detect, and correct problems in the quality of services provided for this project. Quality improvement strategies attempt to improve quality through continuous study and modification of the services being provided.

Section 6.2: Quality Control Checks

QUALITY CHECK	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAMS	FREQUENCY
Visual Check	Verify that there are no unintended model components and the design intent has been followed.		Quadri 2021 Trimble Connect Tekla	
Design Criteria Check	Verify that the design models conform to the respective Roadway/Railway Design Manual.			
Interference Check	Detects problems in the model where two model elements are clashing including soft and hard clashes.		Trimble Connect Tekla	
Standards Check	Verify that the CIM and AEC CADD Standard have been followed (fonts, dimensions, line styles, levels/layers, model partitioning, common coordinate system and model origin, and any required object enablers)			
CIM Guide Check	Verify that the KYTC CIM Guides have been followed.			
Model Integrity Check	Describe the QC validation process used to ensure that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements and the reporting process on non-compliant elements and corrective action plans.			

*NOTE: At a minimum, the design milestones should be at 30%, 60%, 90%, and 100%. Phases of construction will play a part in this, so a heavily phased construction project might do this before starting a next phase.

Section 6.3: Quality Reporting Requirements

NOTE: The Quality Reporting Requirements shall be documented here and in supplemental documentation (Project Management Plan, Specifications). Please make sure that all documents that reference Quality Control and Assurance are aligned and do not provide conflicting information.

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Section 7:
Technological Infrastructure Needs

Section 7.1: Software

USE	DISCIPLINE	SOFTWARE	VERSION
Existing Conditions	ALL	Bentley OpenRoads Designer Autodesk Civil 3D Trimble Business Center Trimble Stratus	2021 2021 V5.7 or newer
Design Authoring	ALL	Bentley OpenRoads Designer Autodesk Civil 3D Quadri Tekla Revit Rhino & Grasshopper	2021 2021 2022 2022
Cost Estimation	ALL	Bentley OpenRoads Designer Autodesk Civil 3D Tekla Trimble Business Center	2021 2021 2022 V5.7 or newer
Constructability Review	Construction	Trimble Quadri	2022
Drawing Production	ALL	Bentley OpenRoads Designer Autodesk Civil 3D Tekla	2021 2021 2022
Design Coordination	ALL	Trimble Quadri Autodesk Navisworks Manage Trimble Connect	2022 2021
Phase Planning	ALL	Trimble Quadri Autodesk Navisworks Manage Bentley Synchro	2022 2021 2021
Construction Authoring	ALL	Bentley OpenRoads Designer Autodesk Civil 3D Trimble Business Center	2021 2021 V5.7 or newer
3D Coordination		Trimble Quadri	202
3D Control and Planning	Mass/Fine Grading	Trimble Business Center Trimble WorksManager Trimble WorksOS	V5.7 or newer
3D Control and Planning	Paving	Trimble Business Center Trimble WorksManager Trimble WorksOS	V5.7 or newer

As-Built Record Modeling	Construction Operation	Trimble Business Center Trimble Stratus Trimble WorksManager Trimble WorksOS	V5.7 or newer

Section 7.2: Hardware

USE	DISCIPLINE	SOFTWARE	VERSION
3D Control and Planning	Mass Grading	Trimble Siteworks, Trimble GCS900, Earthworks, Roadworks, SiteVision	
3D Control and Planning	Fine Grading	Trimble GCS900, AccuGrade, Siteworks, Earthworks, Trimble PCS900, SiteVision	
3D Control and Planning	Roadway Paving	Trimble Roadworks, Trimble PCS900 Earthworks	
3D Control and Planning	Quantity Tracking	LoadRite, Trimble LPM, InsightHQ	
3D Control and Planning	Structures	Access, FieldLink, S-Series Total Stations, Scanners (mobile, terrestrial, UAV)	
As-Built Record Modeling	Construction Operation	Access, Siteworks, Stratus, R-Series GNSS, S-Series Total Stations, SPS hardware, Scanners (mobile, terrestrial, UAV), Spot	
Asset Management and Maintenance	Operations	Cityworks Asset Management, Cityworks Permitting, Trimble Unity Works Management, Telog IoT Remote Monitoring, Trimble Vegetation Manager	

Section 8:
Model Structure

NOTE: Some of the items listed in this section may be external documents or tables. If they are, please provide a brief summary of the document with a link to the current published version.

Section 8.1: File Naming Structure

Client/Project File naming conventions to be referenced.

Insert reference link to File Naming Structure Standard if applicable.

Section 8.2: Model Structure

Pertinent details regarding Client/Project Model Breakdown Structure should be here.

Insert reference link to Model Breakdown Structure Standard if applicable.

Section 8.3: Measurement and Coordinate Systems

Insert measurement system (Imperial or Metric) and coordinate system (geo-referenced) to be used.

Section 8.4: CIM and CAD Standards

Additional resources:

- FHWA Advancing BIM for Infrastructure: National Strategic Roadmap
- FHWA Building Information Modeling (BIM) Practices in Highway Infrastructure March 2021
- FHWA Global Benchmarking Program Report
- FHWA Building Information Modeling (BIM) for Infrastructure How It Affects Your Workflow
- PENNDOT Digital Delivery 2025 Strategic Plan

Section 9:
Project Deliverables

Section 9.1:

Design data models as well as construction data models (like machine control models) are used during construction and help field users develop as built models for delivery to an owner. Digital project deliverables are driven by the project's data standards (standardization for naming of data, structuring the layers of the data, attribution of the data, etc).

As part of a BIM/CIM execution plan you should be making sure your design data that will go to field users contains attributes that help them with their field work but also provide placeholders for as-built data the owner wants to use in operations and maintenance (things like who installed the asset, when, etc).

Your BIM/CIM execution plan should include the format of the digital model data you plan to submit to the owner and it should align with the features and asset attributes the owner requires as part of their data standards for projects. Section 10: Attachments provides more guidance on digital project deliverables.

Section 10:
Attachments

NOTE: Some of the items listed in this section may be external documents or tables. If they are, please provide a brief summary of the document with a link to the current published version.

The following attachments are additional guides and examples that will assist a team in building a BIM/CIM execution plan. Use these attachments to help you verify that your BIM? CIM execution plan is something your team can use in the field. These also will help you align with the design and asset management/maintenance folks in terms of data you should expect for the project and data you should collect and submit for the project.

Section 10.1: CIM Use Selection Worksheet

Link to Use Selection Worksheet if applicable.

Section 10.2: CIM Process Diagrams

Workflow recommendations for use with the CIM execution plan.

Section 10.3: Information Exchange Worksheets

Data sharing recommendations for use with the CIM execution plan.

Section 10.4: Model Definition Worksheet(s) / Content Plan

Data standards and definitions for the CIM execution plan.

Section 10.5: Modeling Protocol Exhibit

CIM Modeling example on content building.

Section 10.6: CIM and Facility Data Requirements

CIM and building/structure data requirements.

Section 10.6: CIM Example Deliverables for As Builts

CIM digital deliverable example content for as builts to the owner.

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