

Annexure-VII-10 IT/5D BIM Requirements**IT / 5D-BIM Requirements of the Employer**

The Contractor shall utilise the PMIS such that all documents generated by the Contractor can be transmitted to the Engineer by electronic means (and vice versa) and that all documents generated by either party are electronically captured at the point of origin and can be reproduced later, electronically and in hard copy. 5D BIM Platform shall be invariably used by the Contractor for PMIS.

The Contractor should actively participate in implementing 5D BIM system adopted by Maha-Metro.

1. Employer has already implemented an Enterprise-wide cloud-based IT system project titled "Integrated Project Management Platform" in Phase-I of NMRP. The objective of the IT project is to develop a working environment that enables higher efficiency and effectiveness, not only in internal functions, but also across the entire ecosystem of the Employer including Contractors. The IT project envisaged following application stack:
 - a. Scheduling services (using Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM) or equivalent).
 - b. Collaborative document control and management services (using Bentley Project Wise and Asset Wise solution or equivalent).
 - c. Progress and performance reporting (using RIB iTWO 5D BIM solution or equivalent).
 - d. Enterprise-wide ERP implementation.
2. The IT system has been conceptualized for facilitating preservation of important artifacts (plans, drawings, notes, documents, reports etc.) in a secure and manageable environment in digitized format. Appropriate triggers shall generate dashboards and management reports every time an event causes a substantial shift in the project risk or a deviation in processes is developed.

The envisaged system would expedite decision-making, ensure better planning and coordination between different functions, better data management, effective reporting, knowledge management etc. Program management shall provide senior management with critical information related to various contracts, activities and funds in the form of management dashboards with inbuilt triggers to ensure timely decision-making.

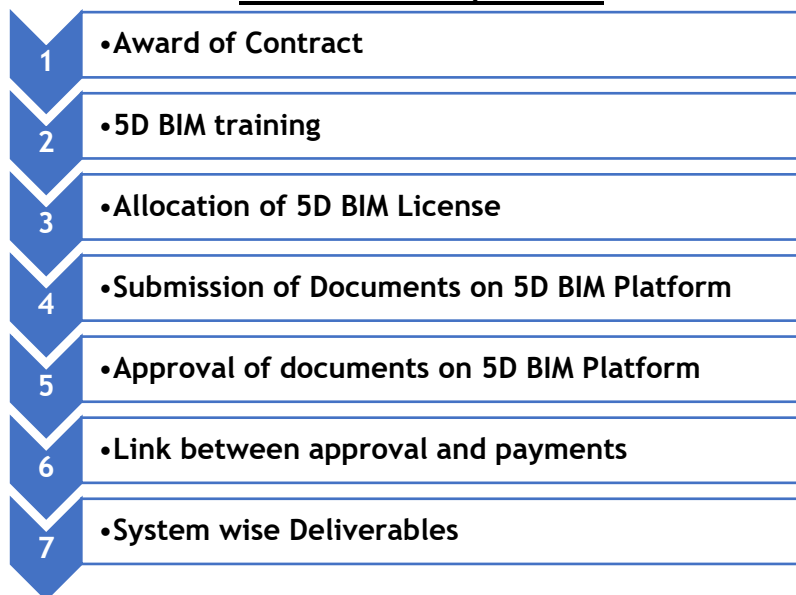
3. The effective use of such IT platform requires availability of front end of web-based system at all requisite locations i.e., with Employers' various offices, Engineer's offices, Contractors' end, Major sub-contractors' end, Design consultant's end, etc. with certain definite users' rights.

Data uploading by various authorized and trained users is key to effective implementation of the IT system.

Employer has recognized this aspect, and the Contractors are required to consider in their proposal the cost of software licenses (payable to Maha-Metro) and IT staff for data uploading as under:

SN	Contract value in Crores	User licenses (below or equivalent software packages)				IT staff
		P6	SAP ERP	Bentley ProjectWise & AssetWise	RIB iTWO 5D BIM	
1	Rs 25 to Rs 50	1	1	5	5	3 (three)
2	Rs 50 to Rs 100	1	3	5	5	3 (three)
3	Rs 100 to Rs 250	3	5	8	8	6 (six)
4	Rs 250 to Rs 400	3	8	8	10	6 (six)
5	Rs 400 and above	3	10	10	10	6 (six)

4. In view of the above, the Contractor shall be required to:
 - a. Follow and comply the system guidelines to be issued by the Employer.
 - b. Comply all the software system competency requirement by taking training from Employer's Training Academy.
 - c. Upload / definition of Project Plans as per the template and using software defined by the Employer.
 - d. Maintenance and updating of uploaded Project Plans in software used by the Employer.
 - e. Uploading of drawings / designs created by the Contractor as per the classification and on the software platform defined by the Employer.
 - f. Key contract related communication and progress related data as per processes defined on the software platform deployed by the Employer.
 - g. Asset details need to be updated in the system in the format prescribed by the Employer.
5. Employer, his IT Project Team and IT Implementation Agency shall render necessary assistance (including providing trained IT staff with requisite skills at Contractor's cost) and handhold the Contractor for usage of the IT system.

BIM Process Requirement

1. **Award of Contract** – Contractor shall ensure the creation of Purchase Order (PO) as per the BOQ schedule by Maha Metro personnel on 5D BIM platform. Any ad-hoc payment to the contractor shall be routed through the PO created in the digital platform.
2. **5D BIM training** – Training to nominated person will be provided for various platforms and processes as per the requirement of Maha Metro, below is indicative list of trainings
 - 2.1. Submission of design, drawing, model & other documents in Common data Environment for its approval by competent authority.
 - 2.2. Guidelines for work programme preparation and updation in planning tool.
 - 2.3. Guidelines to use online billing platform (RFI-RA Bill) through SAP ERP.
 - 2.4. Guidelines to comply for Non-Compliance Report (NCR) and Observations (OBS) raised at site through SAP ERP.

Training would be provided if there is a change in the system process. On the change of nominated person, Contractor shall ensure the knowledge transfer to new assigned person. Repeat training would be charged as per the Maha Metro decision.

3. **Allocation of 5D BIM License** – As per the contract requirement Maha Metro will allocate the required number of licenses for Maha Metro’s 5D BIM platform. The cost of the license provided would be recovered from the contractor on yearly basis. The indicative cost per license is as below:

S. No.	Software	approx. Cost for per license per year (In INR)
1	ERP	45,190/-
2	Scheduling Application	1,01,350/-
3	CDE	2,87,963/-

Note: Above costs are indicative only. Actual cost may vary according to Maha-Metro’s 5D BIM Contract.

4. **Submission of Documents on 5D BIM Platform** – All the different documents specified below in the “Types of Documents” should be prepared as per the Employer Information Requirements (EIR) or the templates and guidelines provided by Maha Metro. And

mandatorily should be submitted only through the 5D BIM Platform. No submissions through any platform other than Maha Metro's 5D BIM Platform shall be entertained. Payment against any submission will be considered only if the documents are submitted on 5D BIM platform.

Types of Documents

BIM Dimension Document	2D		3D	4D	5D	6D
SI No	Documents	Design	Models	Schedule	Cost	O&M details
1	Method Statement	Design	Information Rich Models	Work Programme	Measurement Book	As Built Drawings
2	Project Management Plan	Drawing			Abstract Sheet	As Built Models
3	Safety Health & Environment Plan (SHE Plan)	Construction Reference Documents (CRD)			RFI – all supporting documents for procurement, manufacture & delivery.	Asset Information
4	Factory Acceptance Test (FAT)				RA BILL – all required supporting documents	Maintenance Plan
5	Partial Acceptance Test (PAT)				Milestone Completion Certificate	Maintenance Task
6	System Acceptance Test (SAT)				Invoice Document	List of Spare & Consumables
7	Minutes of Meeting (MOM)				Delivery Challan	OEM manual, part list & Instruction Sheet
**The above list is tentative but not limited. Any Other Relevant document may be added as per the requirement						

5. Approval of documents – All documents mentioned above shall be approved only on 5D BIM platform by competent authority (GC & Maha Metro). Only approved documents on Maha Metro's 5D BIM platform shall be considered for construction/installation/billing as required.

6. Link between approval and payments – To raise RFI-RA Bill (where ever applicable), approved Project Schedule is mandatory to be uploaded and linked with the billing module on 5D BIM platform for validations and processing. No payment requests/bills through any platform other than Maha Metro's 5D BIM Platform shall be entertained.

6.1 5D BIM Validation for Vendor Payment:

The following are the major key validations along with the responsibility matrix that would be checked by the 5D BIM Platform

SI No	Validation Activity	Contractor	GC	Employer
1	Bank Guarantee	Submission	-	Validation and Upload
2	Purchase Order- Item wise	Milestone status/ Bill Book Entries	Review/ Approve	Create/ Change Review/ Approve
3	Key Dates	Analyse and raise request	Review/ Approve	Create/ Change Review/ Approve
4	Checklists of Supporting Documents	Create/ Change/ Upload	Review/ Approve/ Reject	Review/ Approve/ Reject
5	Open NCR/OBS	Comply to raised NCR/OBS	Create/Change/ Review/Approve/ Reject	Review/ Approve/ Reject

All above validations would be processed in the backend of the 5D BIM platform, any deviations shall not be allowed for payment processing. Contractor shall ensure that all the prerequisites for the payment process is completed on the 5D BIM platform to proceed with the running account bill.

7. System Wise Deliverables

Following are the deliverables in form of collaboration with 5D BIM by Contractor: -

- 7.1. Creation of 3D engineered intelligent Models using discipline specific modelling / engineering applications as defined in EIR.
- 7.2. Extracting 2D drawings from 3D engineered intelligent Models in CAD-plan, section, elevation, and other relevant details (based on specific engineering disciplines) to be accessed by the contractors for construction.
- 7.3. Bidder shall comply with the following requirements in regard to the production of all the CAD (3D/2D) data files and building information modeling (BIM) work.

7.3.1. Model File Production Principles

- Bidder shall model all design and construction information as an individual discipline model and then collaborate it in single master 3D composite model, using object-based software, allowing for 2D models/drawings to be extracted as required.
- Bidder shall create and share details of individual components of 3D models for each discipline involved.
- Bidder shall share all individual discipline models as well the collaborated single master model through the Maha-Metro's 5D BIM Platform for review by GC/EMPLOYER. Clash detection and resolution process will run in this composite area.
- All 3D model data together with all 2D drawing extractions needs to be spatially coordinated with the Geospatial System. UTM/WGS84 coordinate system needs to be followed for proper geo-referencing of all the engineered 3D models that will be created.

7.3.2. Model Reviews

- Bidder shall ensure that the level of complexity and granularity for each discipline CAD model is appropriate for the stage of Works.
- Bidder needs to ensure that all disciplines integrate and coordinate their outputs in terms of both spatial and functional provision. This shall be demonstrated through the

extensive use of coordinated design review sessions which shall include for the coming together of all relevant discipline models into a common master model (model composite) where engineering assurance and coordination checks shall take place.

- Weekly & fortnightly reviews has to be attended by consultants/contractor which will be chaired by GC, Maha Metro BIM team and respective CPM. The MOM along with the action points shall be uploaded in the digital platform.
- Action Points of MOM shall be raised as NCR/OBS in the system based on which the payments will be validated. Hence contractor must comply before submitting the bill.
- Existing Infrastructure data sets
 - i. Bidder need to model existing infrastructure and systems in sufficient detail as to provide integration with the works under contract.
 - ii. Bidder need to clearly and highlight the unresolved areas of non-coordination in structure/ Architecture /services/finishes/clashes on the drawings and the model at all times in case of existing infrastructure data sets.
 - iii. Bidder need to report back to the owner any discrepancy with the existing data for their action.

7.3.3. Coordination and integration – Drawing packages

- Within the BIM environment each of the disciplines need to reference other models in a timely manner for coordination purposes. The head of each discipline group shall decide the extent and nature of supporting discipline data that shall be displayed in each of their own discipline drawing submissions. Clash detection software routines needs to be run on the multi-discipline model and on combined master models and any clashes resolved. The reports of which will be submitted on request of the Engineer
- Specific drawing packages are required from each discipline. The drawings need to comprise of 2D extractions of the 3D models from the engineering collaboration system.
- All CAD drawings need to be comprised of 2D models extracted from the 3D master model. Any subsequent design scheme changes that are required to be fully coordinated shall be modeled in 3D and the drawing extraction re-run to produce revised plots.
- All plot composition files need to be checked as prescribed by the workflow setup in the engineering collaboration system before submission to the Engineer.

7.4. The bidder shall take full advantage of the 3D object attributes available in the BIM environment to prove cost, constructional logic, fabrication, and program as required by the EMPLOYER/GC.

Engagement modality expected for Project Management works including 4D 5D BIM requirements: -

- i. Bidder shall allocate a Project Coordinator who would be a single-point contact for EMPLOYER for monitoring day-to-day progress on the Project.
- ii. Bidder will access the Project Monitoring application of EMPLOYER
- iii. Bidder will have to create Work Breakdown Structure (WBS) for its scope of work in the master project prepared and released by EMPLOYER on planning tool.
- iv. Bidder will have to create all the relationships between various activities to generate a Critical Path Network on planning tool.
- v. The project plan will be detailed to reflect the planned construction progress as per the 3D BIM model. This is must, as project schedule will get linked to 3D BIM collaborated intelligent model to reflect and review time based planned progress of project on a BIM model.
- vi. Bidder's project plan on EMPLOYER planning tool will be required at a detailed level as the same gets linked with billing module.

- vii. Once the network has been scheduled and baseline by EMPLOYER/GC, the Project Coordinator will have to provide periodical updates for various activities.
- viii. Bidder will also be required to furnish key cost / budget details along with resources on EMPLOYER's planning platform. Level of details for time plan, cost, and resources from bidder will be communicated to bidder at appropriate stage.
- ix. During the execution stage bidder will be required to operate on EMPLOYER's planning platform to reflect minimum details towards work performed, progress achieved, resources consumed, forecast dates, forecast resources, remaining work along with any other key details as required by EMPLOYER / GC. EMPLOYER will be communicating on level of details as well frequency of such interactions at appropriate stage.
- x. Bidder shall update and revise their work program on the integrated master schedule of the project subject to directions & approval from EMPLOYER.
- xi. Bidder will be required to periodically capture actual progress visualization of respective package work using suitable technology which can be updated in 5D BIM platform.
- xii. Bidder to update/revise the work programme as per the execution if any changes found, every 6 months or as instructed by the GC/Employer planning department or the Employer departmental head.
- xiii. Weekly updates & fortnightly reviews has to be attended by contractor which will be chaired by GC, Maha Metro planning department and respective CPM. The MOM along with the action points shall be uploaded in the digital platform.
- xiv. Action Points of MOM shall be raised as NCR/OBS in the system based on which the payments will be validated. Hence contractor must comply before submitting the bill.

In order to adopt 5D BIM platform bidder need to follow Employer's Information Requirement (EIR). The EIR will enlist the standards, methods, and procedures that one has to follow in order to be BIM Compliant. EIR will have details such as CAD standards, CAD File Transfer formats, Geo coordinate system, Common data Environment (CDE) process, Roles and Responsibilities, Level of Details (LOD), BIM Execution Plan, BIM Standards, Asset Dictionary, Asset Classes, File Naming Convention, Layer naming Convention, Attribute Standards etc.

In order to ensure the quality of BIM Models in 3D Format. The Bidder needs to provide 2 sets of licenses of Revit 2019, Navisworks Manage 2019, and AutoCAD 2019 (Version of mentioned software may be upgraded as and when required by EMPLOYER) to the Employer for checking the suitability of the models and coordination. The software licenses shall be provided to Employer within 30 days of award of contract and licenses shall be valid till 3 months after the project work has been certified as completed by the Employer.

In view of the above, the Bidder shall be required to do the following only on Maha Metro 5D BIM platform:

1. Follow and comply the system guidelines to be issued by Employer/GC
2. Comply all the software system competency.
3. Upload/definition of Project Plans online using the platform.
4. Update of project plans in 5D BIM platform.
5. Maintenance and updating measurement entries and construction milestone entries in software used by the platform.
6. Upload of drawings/designs created by the DDC or contractor as per the design stages
7. Key contract related communication and progress related data as per processes defined on the software platform.

8. Asset Information details and creation of tagging and linking with 3D Modelled elements need to be updated by contractors in the system in the format prescribed by the Employer/GC.
9. Attend weekly, fortnightly, and monthly reviews on update the progress of various work (like submission of design, documents, & models, updation of progress, compiling approved RFI and RA Bill, Asst information etc.). Minutes of Meeting (MOM) will be issued along with the action points/pending list which shall be complied as per dead lines/target dates that are mutually agreed between bidder, GC and employer.

Bidder shall access EMPLOYER's digital platform for at least the mentioned functions as applicable as per bidder's respective scope of work. However, the function list is indicative and precise activities from bidder on EMPLOYER's digital platform will be updated and communicated to bidder on time-to-time basis.

Role and Responsibility of stake holders

SI No	BIM Dimension	Activity	Contractor	GC	Employer
1	2D - Documents	Method Statement	Create/Upload	Review/Approve	Review/Approve
2		Project Management Plan	Create/Upload	Review/Approve	Review/Approve
3		Safety Health & Environment Plan (SHE Plan)	Create/Upload	Review/Approve	Review/Approve
4		Factory Acceptance Test (FAT)	Create/Upload	Review/Approve	Review/Approve
5		Partial Acceptance Test (PAT)	Create/Upload	Review/Approve	Review/Approve
6		System Acceptance Test (SAT)	Create/Upload	Review/Approve	Review/Approve
7		Minutes of Meeting (MOM)	Comply	Create/Upload	Review
8	2D - Design	Design	Create/Upload	Review/Approve	Review/Approve
9		Drawing	Create/Upload	Review/Approve	Review/Approve
10		Construction Reference Documents (CRD)	Create/Upload	Review/Approve	Review/Approve
11	3D - Models	Models	Create/Upload	Review/Approve	Review/Approve
12	4D - Schedule	Work Programme Submission	Create/Upload	Review/Approve	Review/Approve
13		Progress Updation	Actual confirmation	Review/Confirmation /Analysis	Review/Analysis
14		Schedule Change	Change as per requirement	Review/Analysis /Approve	Review/Analysis /Approve
15	5D - Cost	Measurement Book	Create/Upload	Review/Approve	Review/Approve
16		Abstract Sheet	Create/Upload	Review/Approve	Review/Approve
17		RFI – all supporting documents for procurement, manufacture & delivery.	Create/Upload	Review/Approve	Review/Approve
18		RA BILL – all required supporting documents	Create/Upload	Review/Approve	Review/Approve
19		Milestone Completion Certificate	Create/Upload	Review/Approve	Review/Approve
20		Invoice Document	Create/Upload	Review/Approve	Review/Approve

SI No	BIM Dimension	Activity	Contractor	GC	Employer
21		Delivery Challan	Create/Upload	Review/Approve	Review/Approve
22		NCR OBS	Comply	Create/Change/ Review/Approve/ Reject	Review/Approve /Reject
23	6D - O&M	As Built Drawings	Create/Upload	Review/Approve	Review/Approve
24		As Built Models	Create/Upload	Review/Approve	Review/Approve
25		Asset Information	Create/Submit	Review/Approve	Review/Approve /Upload
26		Maintenance Plan	Create/Submit	Review/Approve	Review/Approve /Upload
27		Maintenance Task	Create/Submit	Review/Approve	Review/Approve /Upload
28		List of Spare & Consumables	Create/Upload	Review/Approve	Review/Approve
29		OEM manual, part list & Instruction Sheet	Create/Upload	Review/Approve	Review/Approve
<p>* The above list is tentative but not limited. Any Other Relevant document may be added as per the requirement.</p> <p>** The roles and responsibility may be altered and the same would be informed prior to change</p>					