

## Appendix -A

### (TOR FOR BUILDING INFORMATION MODELLING SERVICES)

#### 1. General Description of Work

(I) "DETAILED DESIGN CONSULTANCY SERVICES FOR **CORRIDOR 1** FROM SARTHANA DEAD END (CH: -450M) TO END OF UG RAMP (CH: 3950M), **ELEVATED VIADUCT, ELEVATED STATION (4 STATIONS)** INCLUDING VIADUCT PORTION WITHIN THE STATIONS AND TRANSITION SPANS ON EITHER SIDE OF THE STATIONS" (II) "DETAILED DESIGN CONSULTANCY SERVICES FOR **CORRIDOR 2** FROM BHESAN DEAD END (CH: -949.63M) TO SAROLI DEAD END (CH: 17791.9M), **ELEVATED VIADUCT, ELEVATED STATION (18 STATIONS)** INCLUDING VIADUCT PORTION WITHIN THE STATIONS AND TRANSITION SPANS ON EITHER SIDE OF THE STATIONS & **DEPOT AT BHESAN**" IN CONNECTION WITH SURAT METRO RAIL PROJECT, PHASE -I

#### 2. Implementation of BIM for DDC Services

On behalf of DDC, the BIM Consultant shall implement BIM system for executing and delivering the services set out in this Agreement. Building Information Modelling (BIM) uses computing power and systems to create 3D models of all kind of buildings and infrastructure, with information about its design, operation and current condition. At the planning and design stage it enables designers, owners and users to work together to produce the best possible designs and to test them virtually before they are constructed. During construction, it enables GMRCs, contractors and suppliers to integrate all components cutting out waste and reducing the risk of errors. In operation it provides users with real-time information about available services and facility managers with accurate assessments of the condition of assets. All station designs (including architectural design, structure design, E&M services design, interior fit outs, plumbing design etc.) and viaduct designs/proof checking shall be done using BIM modelling. The BIM Consultant shall implement and maintain, for entire duration of the project, necessary hardware, software and human resources towards this end in their office and provide same software with subscription support/upgrade up to project duration for 2 users for use of GMRC personnel and shall arrange training for 5 personnel of GMRC. The BIM Consultant together with DDC shall be required to produce, update and present to GMRC on a fortnightly basis an integrated 3D BIM model incorporating rail track, topography, architecture, structure, plumbing and all other building services and system wide requirements in design review meetings. These models shall be 3D rendered and shall help in design visualization and clash detection of elements as well as finalization of design.

## TERM OF REFERANCE OF BIM IMPLEMENTATION WORK FOR SURAT METRO DDC SCOPE

In addition, the BIM Consultant shall also provide following individual models: -

1. Station Architecture Modelling
2. Station Mechanical Modelling
3. Station Electrical Modelling
4. Station Plumbing Modelling
5. Station HVAC Modelling
6. Rail Track Modelling
7. Terrain modelling
8. Clash Detection
9. Quantity take off from BIM model
10. Visualization and Animated Walkthroughs for each type of station.

The BIM model has to be delivered in LOD 300 to 500 depending on stage of work. The general scope included building Architecture & Structural models of (LOD :- 400) including stations and viaducts. Coordination with other disciplines as well as matching with Quantity take off from the models.

Final coordinated GFC drawings of all disciplines shall only be generated from the BIM model in clash free condition.

Detailed cost estimates shall also be prepared only on the basis of approved 3D BIM model generated quantity take off .

### **3. Submission of preliminary design drawings (in BIM software) including interchange scheme based on approved concept design drawings, including modifications if any:**

During the submission of preliminary design drawings, the BIM consultant shall integrate with DDC and deliver all the responsibilities jointly and severally. The preliminary design of the specified work shall be developed from the approved concept drawings, specifications and design criteria mentioned in the Detailed Project Report (DPR) prepared by DMRC. Any critical difficulty identified shall be immediately drawn to the attention of GMRC, but not withstanding that, the BIM Consultant shall remain totally committed to the overall integrity of the design, if necessary, actively seeking advice, information and clarification to avoid abortive work.

The preliminary design may include:

- Design calculations to reflect the scope of the work to be executed.

## TERM OF REFERENCE OF BIM IMPLEMENTATION WORK FOR SURAT METRO DDC SCOPE

- Preparation of preliminary strategies for stations including commercial & retail development and optimizing retail area and revenue enhancement opportunities in the stations.
- Drawings based on approved Concept Design, including modification and pending details, if any.
- Area statement.
- All typical details
- Facade details.
- Signage location layout details.
- Draft of Bill of Quantities and specifications.
- Identification of conflicts within the right of way of the civic bodies and resolutions to problems Identified.
- Cost estimates for design alternatives approved/adopted by GMRC.
- Any omissions or errors are resolved.
- Design Basis Report (The DBR shall be updated continuously till the approval of the GFC drawings. This report shall clearly communicate planning guidelines, egress calculations, room schedule, typical details, materials /finishes etc all complete for the document purpose).
- The BIM Consultant in conjunction with DDC shall investigate each site in support of the environmental review process as it relates to surrounding neighbourhoods and property development, both existing and proposed; and also, the environmental impacts upon present and committed future recreational facilities, parks or other open spaces and landscaped facilities. The detailed design shall be finalized after the environmental review is completed.
- Designs of FOB, Skywalks underpasses or similar structure

This shall include as a minimum the following:

- Identify levels of architectural and landscaping treatment necessary to mitigate environmental impacts whether physical, visual or noise related, in relation to the preparation of an Environmental Impact Report which may need to be coordinated with relevant Government and Municipal Departments. Provide continuing design support to the environmental review process.
- Prepare such designs as may be required to address and mitigate potential environmental impacts upon present and committed future recreational facilities, parks or other open spaces and landscaped facilities.

## **TERM OF REFERANCE OF BIM IMPLEMENTATION WORK FOR SURAT METRO DDC SCOPE**

The BIM Consultant shall address additional issues as required to support the architecture and urban design concepts for station sites and property development, including but not limited to:

- Building control dimensions
- Height, depth, setback and massing requirements
- Major features such as building arcades
- Street/wall relationships
- Other relevant issues

It is the Consultant's responsibility to conduct and manage an adequate and thorough clash detection process so that all major interferences between building components will be detected and resolved before submission of GFC drawings for construction.

All the Clashes found, shall be reported in the form of Clash Detection Reports with comments on their severity in pdf or excel format. Employer/ Client's Design Team shall review the clash report & Design team will provide the resolution for the submitted clashes. Following this, the Model is expected to be Clash free and therefore all design coordination issues would be resolved as per requirement of Employer/Client GMRC.

### **4. Approval of Preliminary Design Drawings**

After submission of Preliminary design drawings, approval of the same has to be taken from GMRC to proceed to next stage.

### **5. Technical Equipment for BIM Production**

The typology of the project suggests that the most used software will be as listed below:

- For Architecture and MEP- AUTODESK REVIT
- For Structures- AUTODESK REVIT/TEKLA
- For Urban planning and Earth works- RAILTRACK/ISTRAM
- For Coordination, review, collision detection and data extraction- AUTODESK NAVISWORKS MANAGE
- For measurements and quotes- TCQ BIM, NAVISWORKS Quantification
- For Planning- NAVISWORKS Construction Simulation

### **6. Execution**

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The team dedicated to the implementation of the uses of BIM during the construction phase includes the following team as well as the modelers of each discipline. To allow coordinated and collaborative work with the information validated at each phase of the project, a common data environment (CDE) is created to access and manage data. Each discipline has a BIM coordinator responsible for ensuring the quality of the model and for coordinating with other disciplines during the model development phase. These models once validated by the coordinators, enter the coordination verification phase and collision analysis between building systems. At this point, the BIM coordinators together with the BIM Manager, generate the tests and reports. The results of coordination and collision tests are discussed between all the members of the project in order to find and propose appropriate solutions in each case. The process ends with coordinated and validated models that extract the required deliverables in a reliable and consistent manner.

### **7. Confidentiality and Intellectual Property Rights**

- BIM Consultant and the DDC shall keep all information confidential pertaining to the services
- Copyright for all models, presentation reports, documents and the like produced by BIM Consultant in the performance of the services shall remain vested with the BIM Consultant but they shall grant an irrevocable royalty free license to the DDC to use such reports, models, documents and the like for any purpose in connection with the project.

### **8. Modification & Reworking of Developed Models.**

- BIM Consultant to the DDC work shall modify and do the reworking of the developed models to incorporate observations raised by Employer , client GMRC's Engineer in the reviewing process with out any additional cost.
- All such modification or alternation works of previously submitted Models are deemed to be included in the original quoted costs. No further payment will be admissible at any point or periods of Contract. If any task requires consultant has to mobilise onsite deployment of team members for better interfacing with field data.