REPUBLIC OF CROATIA

MINISTRY OF PHYSICAL PLANNING, CONSTRUCTION AND STATE ASSETS

EARTHQUAKE RECOVERY AND PUBLIC HEALTH PREPAREDNESS PROJECT

TERMS OF REFERENCE FOR CONSTRUCTION PROJECT MANAGEMENT CONSULTANCY SERVICES DURING CONSTRUCTION PHASE FOR CLINIC HOSPITAL CENTER ZAGREB

Proc.ref.no.: MoPPCSA/ER&PHPP/C1.2.3/CS-QBS

I. PROJECT BACKGROUND

The Republic of Croatia (RoC) with financing from the International Bank for Reconstruction and Development (IBRD) through the Loan Agreement (Loan No. 9127-HR) is implementing the Earthquake Recovery and Public Health Preparedness Project. Project Development Objective (PDO) is to assist Croatia with earthquakes reconstruction efforts in Zagreb and the surrounding areas, Sisak-Moslavina County and Karlovac County, improve institutional capacity for reconstruction, and strengthen national systems for public health preparedness. The project implementation period spans between 2020 and 2024. The project comprises three components: (1) Earthquakes Recovery and Reconstruction; (2) Public Health Surveillance and Preparedness; and (3) Project Management. Part of the loan funds are intended to be used for reconstruction of buildings in health and educational sectors that are damaged in earthquake. The project is implemented by the Ministry of Physical Planning, Construction and State Assets (MoPPCSA) and the Ministry of Health (MoH), in coordination with other institutions. The Project Implementation Unit of the MoPPCSA (PIU 1) is responsible for Component 1, as well as civil works under Component 2.

There are currently several buildings on the existing cadastral parcel - a hospital building for health purposes consisting of several above-ground volumes, a common underground part, and buildings with accompanying technical purposes. The buildings are of different sizes and heights. The main buildings are connected by internal underground corridors, as well as external vehicular and pedestrian areas. The Phase III building site currently has a hospital pharmacy and kitchen that are connected to other hospital buildings. These buildings will be temporarily removed during the construction process, but their connections with the rest of the hospital center will still be maintained. On the northern part of the particle there is a parking lot that does not meet the needs of the hospital complex and new construction with its capacity, and for this reason the construction of the auxiliary building in question is planned in this place – an above-ground open garage.

CHC Zagreb is the largest and in terms of the number and diversity of health services provided by a unique health institution in the RoC. The Clinical hospital provides basic care and highly sophisticated medical procedures to healthcare users from all over Croatia and abroad. Since 2014,

CHC Zagreb has been categorized as a *0 central national hospital* in which health activities of national importance are carried out and the most complex forms of health service provision are performed and is the only one in the RoC of this category. The status of the Central National Hospital awarded to the CHC Zagreb by the MoH is a great recognition, but also a guideline for future activities to maintain and improve the quality of our services. Using the superior academic education of CHC employees, the hospitals solve a wide range of health problems, with the emphasis always placed on an interdisciplinary and individual approach to each user.

In addition to the basic health care provided, the hospital explores the latest methods of treatment, which, while respecting strict scientific criteria, we introduce into everyday work. This is evident through the fact that the hospital is the headquarters for 81 reference centers of the MoH, whose task is to continuously monitor and systematically promote certain areas of the medical profession in our country. The hospital focuses on educating its employees and educating future healthcare professionals. Therefore, the hospital has the largest database of clinical teaching of the Faculty of Medicine, University of Zagreb, and Polytechnic of Zagreb.

CHC Zagreb is the leading hospital institution in the RoC and has pioneered various medical procedures, some of which were performed for the first time in Europe and the world. CHC Zagreb continuously introduces new and innovative diagnostic and therapeutic procedures, while maintaining the status of the leading hospital institution in the RoC, which is gravitated to not only by citizens of the entire RoC, but also from neighbouring countries, and especially when it comes to demanding medical cases.

CHC Zagreb, as the Central National Hospital, has 1,795 beds contracted with the Croatian Health Insurance Institute for lying patients, 435 beds - chairs for day hospitals in 6 locations (Rib, Jordanovac, Petrova, Šalata, Bozidarevićeva and Gundulićeva) and 6,002 employees. Within CHC Zagreb there are 29 Clinics and Clinical Institutes. CHC Zagreb also has a Unified Hospital Emergency Room, Hospital Pharmacy and Croatian Tissue and Cell Bank (Cord Blood Bank, Human Milk Bank, Reproductive Tissue Bank and Tissue Bank).

The following clinics were affected by the earthquake: Orthopaedic Clinic, Dermatovenerology Clinic (at Šalata site) and Eye Clinic, and Clinical Institute for Transfusion Medicine and Transplantation Biology with Tissue Banks (at the Kispatićeva 12 site, Rebro).

The development project Phase III of CHC Zagreb plans to include 123 beds. Reducing bed capacity increases access to day hospitals and one-day surgeries. Any reduction of acute hospital resources and the redirection of patients to the resources of day hospitals represents a reduction in health costs and in the long term enables improvement and long-term sustainability of the quality of health service in the RoC and improves the standard of treatment and stay of patients.

The new structure will be located in the central area of the hospital circuit, with easy access to the connecting tunnel and convenient internal delivery routes. This is particularly important for the kitchen and pharmacy. The location is situated near the operating block, creating a direct connection between clinics and operating rooms.

The new building construction will accomplish several goals, including the strategic development and unification of CHC Zagreb clinics at the Rebro location. It will also improve the functionality and efficiency of CHC Zagreb and increase the quality of infrastructure and health services. Patients will also benefit from a more comfortable hospital space. Additionally, staff working conditions, teaching, and research capacities of CHC Zagreb will improve. Operating costs will decrease, and energy efficiency will increase, along with a reduction in greenhouse gas emissions. An automatic temperature control system and space illumination will also be introduced.

The Phase III hospital building is situated at the center of the hospital complex, adjacent to the operating block building. The upcoming structure will replace the existing non-medical facilities, including the Hospital Pharmacy with Warehouse and Production, Central Kitchen, Educational Premises for Students, Warehouses, Central Archives, and Technical Premises. It consists of a total of 7 floors – 2 basements, ground floor and 4 floors. The building has a rectangular floor plan with dimensions of approx. 100,80 m x 52,2 m, oriented northwards for a longer part. The projected total gross area is approximately 34.789,6 m^2, placed on 7 levels: 2 basement levels, ground floor and 4 floors.

On the same plot, there is a separate building that includes an open garage with a gross area of 31.406 m^2. The garage is situated on 5 levels: basement level, ground floor and 3 floors, emergency helipad on the last level and access road. The above-ground garage is situated on the northern side of the hospital complex, replacing the previously open parking lot. The garage is meant for use by hospital staff, patients, and visitors seeking healthcare services at the hospital complex. The building primarily serves as a garage with 1,045 parking spaces for passenger cars. Of these spaces, 55 are reserved for individuals with disabilities or reduced mobility.

As part of the plan to reconstruct CHC Zagreb Rebro, Phase III will focus on upgrading hospital facilities and constructing an open above-ground garage for auxiliary use, access road, emergency helipad, redevelopment of vehicular and pedestrian areas and traffic at rest all in the form of new traffic regulation. This is in line with the Conceptual Design that has been developed for the project:

i. Medical facilities which are included:
- Orthopedic Clinic;
- Clinic for Eye Diseases;
- Clinical Institute for Interventional and Diagnostic Radiology;
- Clinical Institute for Pathology and Cytology;
- Clinical Institute for Transfusion Medicine and Transplantation Biology with Tissue Banks.

ii. Non-medical facilities which are included:
- Hospital pharmacy with warehouse and production;
- Central Kitchen;
- Educational facilities for students;

- Central wardrobe;
- Warehouses, Central Archives and Technical Areas and auxiliary building.

A new building with reconstruction would be built on the site where today there are non-medical facilities (Hospital Pharmacy with Warehouse and Production, Central Kitchen, Educational Premises for Students, Warehouses, Central Archives and Technical Premises) which are vital for the continuous provision of health care to patients.

The first version of conceptual design for CHC Zagreb hospital has been completed in January 2021 by Gradit d.o.o. from Zagreb. In March 2023, a Medical and Design Brief was completed for CHC Zagreb for the construction of selected facilities. The brief included key parameters, functional descriptions, and space demand. This information was used to develop a new version of the Conceptual Design **(ANNEX 1),** which was completed in April 2023 when a request for obtaining amendments to the Location Permit has been submitted. Main Design was completed in July 2023 **(ANNEX 2;** pending approval), while Detail Design will be completed in November 2023. Design consultancy services have been contracted with JV ZDL Arhitekti, fsp Architekten AG and Mack Projekt.

Design documentation has been developed in the Building Information Modelling (BIM) environment. It encompasses Main and Detail Design in the form of BIM models, textual parts, studies, drawings, Quantity Take-offs, and Bill of Quantities. The Common Data Environment (CDE) is being used as a mean of information sharing and collaboration between project stakeholders. CDE has been established for the design phase. BIM requirements related to the design phase are shown in **ANNEX 3.**

Although the Conceptual Design and the Location Permit mention two separate phases, only phase 1 described therein is part of the scope of construction works. Phase 2 i.e., Construction of infrastructural joint – electrical / power conduits is exclusively under the jurisdiction of Hrvatska elektroprivreda d.d. (HEP) and HEP will produce the entire design documentation and execute works foreseen by that phase. HEP will develop the project plan and implementation of the connecting cable route in accordance with environmental planning.

This project envisages the reconstruction of the central heating station of CHC Zagreb – Rebro as a part of works contract, which will ensure a continuous and secure supply of existing and new consumers of heating and sanitary hot water connected to the system, replacement, and reconstruction of worn-out and inadequate parts of the system and ensure the planned connection of new consumers for the extension of the Phase III building. Design documentation for reconstruction of central heating station is under development using CAD software and will be finished in November 2023.

II. SERVICES OBJECTIVE

The Client shall appoint the Construction Project Manager to optimize the use of funds and time before passing investment decisions and plan budgetary funds as well as ensure legal and quality project preparation and its successful implementation. The Construction Project Manager shall be responsible to the Client for the lawful and proper execution of the works specified in this ToR.

The project management service is governed by several legal acts, including the Law on the Physical Planning and Civil Works and Activities (*OG 78/15, 118/18, 110/19*), Law on the Croatian Chamber of Architects and Croatian Chamber of Construction and Physical Planning Engineers (*OG 78/15, 114/18, 110/19*), Rulebook on the project management Know-how (*OG 85/15*) and other applicable legal acts/regulations.

According to the mentioned Regulations construction project management service includes following tasks:

- financial, legal and technical consultancy regarding project design, construction, usage and removal of buildings;
- financial, legal and technical preparation and planning of the construction-related tasks and monitoring the implementation of the plan;
- programming and planning in the project conception stage which includes data collection, project program development and monitoring the implementation of the program;
- consultancy, selection and contracting of the tasks for the project designer, design auditors, supervisory engineers, contractors, licensed geodetic engineers and other persons performing the construction-related tasks and advising on contracting the works with these entities/persons;
- linking and harmonising the work of project designer, design auditors, supervisory engineers, contractors, licensed geodetic engineers and other entities/persons who participate in the construction as well as supervising their work to protect the rights and interests of the Client;
- obtaining documents, analyses, studies, elaborates and other documents required for the production of the Conceptual, Main and Detail Design projects and the Demolition Design;
- obtaining all the documents and concluding all legal affairs required for issuing the document on the implementation of physical plans, construction, usage and/or removal of a construction and obtaining these documents;
- obtaining all the documents and concluding all legal affairs required for construction of the building and performing actions that the Client must perform during the construction of the building;
- project control system development and its monitoring and implementation control which involves the development and overview of a planned schedule with engaged resources, updating of the initially planned as compared to the project realization, dynamic risk analysis throughout the project, report on the quality control of the investments archived,

proposed solution for the current or projected problems in the temporal, technological and cost aspect of the realization.

This consultancy service includes construction project management activities regarding the execution phase of the CHC Zagreb Rebro Phase III (The Project).

III. SCOPE OF SERVICE AND TASKS

The Project consists of following 3 key activities, i.e., contracts that already are or will be concluded with contractors and service providers (hereinafter: Activities):

- CHC Rebro Phase III Works contract
- professional supervision of Works services;
- design supervision and technical assistance.

Other, secondary activities that interfere with and coincide with Project implementation may occur, but those activities shall be of a short-term and insignificant compared to overall duration of the Assignment. Nevertheless, the Consultant may be required to assist, participate, and provide support in those activities upon Client's request. Such activities may include (but not limited to):

- development of temporary traffic regulation study;
- reallocation of 5G telecommunication equipment;
- installation of medical and non-medical equipment in the Phase III hospital building;
- reconstruction of roundabout in Kišpatićeva street in the North-West of the CHC complex;
- construction of infrastructural joint – electrical / power conduits which is under the jurisdiction of Hrvatska elektroprivreda d.d. (HEP).

There are also several other works contracts currently in force or pending commencement, taking place within CHC complex. The employer in these contracts is CHC Zagreb and they are not subject of this Assignment, however, the Consultant may be requested to coordinate and communicate with other stakeholders and third parties engaged in these contracts. The Consultant will also ensure all activities will be carried out in line with the WB Environmental and Social Framework (ESF) and related documents of Rebro Phase III project.

Consultant is responsible for execution of the below listed tasks:

TASK 1: Development of post-appointment BIM Execution Plan (BEP)

Post-appointment BIM Execution Plan (BEP) is a key document that defines the goals for the implementation of the BIM methodology in a project and shall be developed according to the requirements defined in the EIR **(ANNEX 4)** and in a timely manner.

Submitted post-appointment BEP will be reviewed by the Client and approved or returned for revision and/or resubmission.

All deliverables during the project execution shall be in accordance with agreed post-appointment BEP.

TASK 2: Establishment and implementation of Common Data Environment (CDE) for construction phase

CDE for construction phase shall be established and implemented according to requirements stated in the EIR **(ANNEX 4)** and post-appointment BEP, and in a timely manner. Structure for CDE for construction phase shall be defined in coordination with the Client and after approval of the structure, CDE shall be established and implemented. Structure of CDE shall enable the collaboration and data exchange between all project stakeholders (e.g., Beneficiary, Client, Designer, Contractor, Supervising Engineer, FIDIC Engineer, and Construction Project Manager). After CDE establishment, the Consultant shall provide technical assistance to the Client during CDE implementation.

The Consultant shall manage, monitor, and control the project CDE according to requirements defined in the EIR including the entire process of sharing, submitting, publication and archiving of information on the CDE (it is necessary that versions of all documents and models are submitted through CDE and that all documents and models follow the agreed terminology, nomenclature, metadata, organization, etc.). Access, permissions, and restrictions within CDE of all project stakeholders shall be clearly defined for each project stakeholder (i.e., restrictions connected to the information, data and documents sharing, publishing, editing, and archiving) in the post-appointment BEP. Licenses and BIM training for CDE for all stakeholders will be provided by the Client and this is not part of this consultancy services.

TASK 3: Project planning, monitoring and controlling

Consultant shall monitor, and accordingly control the implementation of the Project which shall include:

- proposing of hierarchy levels of information breakdown structure (including Work Breakdown Structure (WBS) and Cost Breakdown Structure (CBS)) for the purpose of time schedule and financial plan monitoring and submit to Client for approval;
- continuous planning, monitoring and controlling throughout project implementation in accordance with approved information breakdown structure (including WBS and CBS), including reporting to the Client, as defined in TAKS 9 (reporting requirements);
- performing Earned Value Analyses (EVA) during monitoring and controlling processes as main project monitoring and controlling method;
- monitoring, controlling, and verifying project completion progress for the purposes of verification of contractual payments milestones/baseline (completion progress report shall be part of regular reporting deliverables);
- monitoring, controlling, and verifying time schedule and financial plan update according to changes and variations during project implementation.

All Project planning, monitoring and controlling activities shall be performed using adequate BIM software for construction and project management (4D/5D BIM software) that enables BIM uses delivery. Licenses and BIM training for 4D/5D BIM software for all stakeholders will be provided by the Client and this is not part of this consultancy services. Purchased software will be used by other project stakeholders (e.g., Client, Contractor, Supervising Engineer, FIDIC Engineer, and Construction Project Manager) and will have all functionalities for delivery of all BIM uses specified in the **ANNEX 4.**

TASK 4: Risk management

The objective of risk management is to either avoid or reduce the risks in project implementation to an acceptable level by implementing mitigation measures in order to reduce the probability of risk occurrence or the impact of risk realization or both at the same time.

The Consultant shall develop risk management methodology that will include at least the following:

- risk identification;
- possible consequences of risk occurrence;
- impact of the consequences on project implementation;
- estimation of occurrence probability;
- risk matrix based on occurrence probability and impact;
- proposed risk avoidance measures;
- proposed risk mitigation measures.

Risk management shall be presented and carried out through the Risk Register. The Risk Register shall be a part of the Inception Report and regular Monthly reports. Consultant shall continuously advise the Client regarding risk management, immediately upon risk occurrence.

In the risk analysis the Consultant shall include the analysis of all risks identified also by other project participants.

Risk management shall include all Project related risks including Environmental and Social (E&S) risks and mitigation measures defined in Environmental and Social Management Plan (ESMP). ESMP for construction phase will be available upon start of bidding process for works.

TASK 5: Support in procurement processes

Consultant shall, if requested by the Client, provide support to the Client in procurement of contractors and service providers. Such support may include (but not limited to):

- monitoring and advising during the preparation of Bidding Document and contract documents;
- control and evaluation of documents received during procurement process;
- reviewing and reporting on proposals received;
- analyzing and preparing of cost evaluation;

- preparing answers on questions and requests for explanation during the collection of proposals.

TASK 6: Coordination of project stakeholders and communication with third parties

The Consultant shall provide support to the Client in coordination of project stakeholders and any other parties involved in the project. The Consultant shall provide support and assist with the following:

- coordination and representation of the Client's interests;
- communication with stakeholders, project partners and third parties representatives;
- development of the communication plan and procedures within the post-appointment BEP;
- ensure communication and collaboration of stakeholders through CDE in compliance with accepted post-appointment BEP.

TASK 7: Administrative, technical and BIM support

The Consultant will assist in performing of administrative and technical management duties in accordance with the contractors' and service providers' contract conditions, relevant laws and regulations. Also, when applicable, the Consultant will assist in performing activities in line with the relevant BIM principles. The Consultant shall ensure the implementation of contracts in accordance with its obligations.

Consultant shall monitor implementation of all project activities and respond accordingly. Consultant shall promptly notify the Client with details of any factors that may jeopardize the implementation of project. Consultant shall assist with the following:

7.1. CHC Rebro Phase III Works

During the implementation of works contract, Consultant is obliged to perform following activities:

- verification and approval of Insurance, Performance security and any other warranties submitted by the Contractor;
- review of any models, designs, blueprints, graphical and non-graphical data (excluding As-Built documentation), reports and other documentation submitted by the Contractor (i.e., Contractor's Documents);
- participation in regular weekly and monthly meetings, construction site coordination meetings and construction site visits;
- continuous monitoring and controlling of schedule, cost of works and expenditures and reporting to Client;
- verification of advance, interim and final payment certificates, invoices and other documentation;
- monitoring the implementation of environmental protection measures and safety at work measures;

- ensuring implementation of measures identified in Environmental and Social Management Plan (ESMP);
- respond to Client when the Engineer is seeking Client's prior approval before acting. The Engineer shall have following limitations in powers:
    - Article 3.7 (Agreement or Determinations): Determination of matters;
    - Article 5.1 (Subcontractors): Approval of subcontractors;
    - Article 8.9 (Employer's Suspension): Temporary suspension of Works or part of the Works;
    - Article 13.1 (Right to Vary): Initiation of Variations if such variation requires changes in Terms of Reference for Works.

As project will be implemented in line with the BIM principles, the Consultant shall provide support to the Client in the BIM management. Therefore, the Consultant shall have knowledge and skills to implement BIM standards and principles.

The Consultant shall participate in the development and review processes of post-appointment BEP of the selected contractor. This includes support to the Client in implementation of all requirements defined in the EIR **(ANNEX 4),** General and Particular Contract conditions, Specification and Bidding Document.

The Consultant shall participate in quality analysis (compliance with Croatian regulations, compliance with Bidding Document, EIR, post-appointment BEP, BIM principles and standards, etc.) of all contractor's deliverables which include BIM models, other graphical and non-graphical data and documents (e.g., 4D BIM model, 5D BIM model, reports, etc.) and which shall be submitted through the CDE.

The works contract is being implemented under FIDIC (*Fédération Internationale des Ingénieurs-Conseils*) Conditions of Contract for Construction for building and engineering works designed by the employer (Second Edition 2017). The governing law is of the Republic of Croatia.

7.2. Professional supervision of works

The contract on supervision of works will be concluded by the Client with the legal entity that will perform the services. The Consultant is obliged to monitor the execution of supervision of works contract in accordance with its obligations. During the implementation of supervision of works contract, Consultant is obliged to perform following sub-tasks:

- verification and approval of any contract related documents and deliverables submitted by the service provider;
- quality control of the supervision services;
- control and approval of supervision service provider reports;
- monitoring of supervision service provider presence on construction site and in contract implementation in general;

- ensuring the fulfilment of Engineer's obligations in accordance with supervision of works contract and works contract.

As the project will be implemented in line with the BIM principles, the Consultant shall provide support to the Client in the BIM management. Therefore, the Consultant shall have knowledge and skills to monitor and control the implementation of BIM standards and principles during supervision of works.

The Consultant shall participate in quality analysis of all Engineer's deliverables which include graphical, non-graphical data, and documentation (e.g., reports) and which shall be submitted through the CDE.

7.3. Design supervision and technical assistance

Design supervision is an activity within the contract on design development services, concluded between the designer and the Client. The Design supervision is a service performed by the Designer that has produced the overall project documents, during the construction works regarding challenges and complications during construction, that cannot be unambiguously determined from design documentation but require additional engagement of designers on-site. The Designer under this contract shall update of BIM models and related deliverables according to the requirements in the construction phase. The Consultant shall collaborate closely with the Designer in the implementation of the aforementioned activities, in terms of coordination and communication, and shall monitor and menage the implementation of the Designer's tasks.

The Consultant shall participate in quality analysis of all Designer's deliverables which include graphical, non-graphical data, and documentation and which shall be submitted through the CDE.

7.4. Secondary activities

Regarding aforementioned secondary activities, the Consultant, upon Client's request, shall be required to track and monitor the implementation of these activities and respond by advising and consulting the Client on the unfolding events. In that case, these activities shall be included in reporting obligations, risk management, coordination and communication etc.

TASK 8: Legal support

The Consultant shall, when requested by the Client, provide legal support and advisory to the Client regarding following (but not limited to):

- preparation of possible amendments to Rebro Phase III Works contract or supervision of works services contract, reviewing amendments prepared by the Client;
- advising the Client when dealing with other parties/participants involved in the realization of the project;
- counselling the Client on resolving situations where legal action against other parties/participants may be necessary;
- analysis of the contractor's claims and the basis for the Client's claims;

- legal support to the Client in the preparation of responses to appeals in proceedings;
- support in Claims, Disputes and Arbitration Proceedings before the Dispute Avoidance/Adjudication Board (DAAB);
- consulting regarding the preparation and initiation of arbitration, court and/or other proceedings in relation to the project, without representation in these proceedings.

TASK 9: Participation in the meetings and reporting requirements

The Consultant shall participate in the Kick-off meeting, during which both the Client and the Consultant shall present their team. The Kick-off meeting shall be held a few days after the date on which the contract governing the Consultant's engagement for the services (the Contract) enters into force.

After the Kick-off meeting the Consultant shall review all existing relevant documentation and develop an Inception Report with appropriate material discussing the feasibility of the project, special problems, risks, and opportunities. The Inception Report shall be in line with project management standards (e.g., PMI) and shall include a description of monitoring and controlling processes of the project execution, and suggestion of monthly reports content.

Results of monitoring and controlling activities shall be included in Monthly Reports which shall be developed in accordance with the defined scope within Inception Report. Submitted reports will be reviewed by the Client and approved or returned for revision and/or resubmission.

Monthly Reports are the monthly meeting preparation materials and shall be developed in a timely manner. Monthly meetings shall be held a few days after the submission of the Monthly Report by the Consultant and according to the agreed time schedule. Consultant shall participate on the monthly coordination meetings. The monthly reporting period corresponds to the calendar month and starts from the month following the month in which this contract is concluded.

The Consultant shall prepare draft Coordination Meeting Reports of each meeting held and distribute them to the Client (only when the preparation is not the obligation of the Engineer). The Client shall provide comments on those draft Reports.

The Consultant shall organize and/or participate on the ad-hoc meetings, which the Client or Consultant convenes or announces to the other party few days in advance in writing with a draft agenda for that meeting attached. The Consultant is also required to prepare draft Coordination Meeting Reports of such meeting and submit them to the Client.

The Consultant shall also develop any other Specific Reports (in line with project management standards) according to the Client's requirements whose content will be determined and agreed between the Consultant and the Client, as well as submission deadline.

During the execution project phase Consultant shall also participate in regular weekly and monthly meetings, construction site coordination meetings and construction site visits.

At the end of the consultancy service engagement the Consultant shall develop a Final Report which shall include project summary, project execution analysis, cost, and time analysis etc. and shall be in line with project management standards.

Reports shall be written in English language and each report (Inception Report, Monthly Reports, Coordination Meeting Reports, Specific Reports, Final Report) shall have one page summary in Croatian language.

Reports shall be prepared in accordance with the EIR **(ANNEX 4)** and post-appointment BEP and in a timely manner.

IV. SUBMISSION AND TIME SCHEDULE FOR DELIVERABLES AND REPORTING REQUIREMENTS

During the Assignment, Consultant shall prepare and submit appropriate deliverables to the Client for approval. All deliverables shall be submitted through CDE, according to the requirements in the EIR and post-appointment BEP.

Time schedule for deliverables is as follows (days listed below are calendar days):

No.	Name of deliverables	Delivery deadline	Responsible for submitting	Responsible for reviewing and approving	Timeline for approval
1	Post-appointment BIM Execution Plan	fifteen (15) days after Commencement of Services	Consultant	Client	ten (10) days after submission
2	Structure of Common Data Environment (CDE)	fifteen (15) days after Commencement of Works	Consultant	Client	ten (10) days after submission
3	Inception Report	thirty (30) days after Commencement of Services	Consultant	Client	seven (7) days after submission
4	Monthly Report	monthly	Consultant	Client	seven (7) days after submission
5	Coordination Meeting Report	following day	Consultant	Client	one (1) day after submission
6	Specific Report according to the Client's requirements	will be agreed during implementation	Consultant	Client	seven (7) days after submission
7	Final Report	fifteen (15) days before end of service	Consultant	Client	ten (10) days after submission

The Consultant shall ensure completion of services on time. Any delay shall immediately be communicated to the Client, with a rationale for their occurrence and a plan to mitigate the impact

of such delays. All deliverables prepared in connection with the service shall immediately be submitted to the Client for its review and approval. The Client will review and approve or return deliverables for revision and/or resubmission within the previously defined period in the table or any other period defined by the Client upon receiving each of the deliverables.

In the Contract, the Consultant shall assign all intellectual property rights of its work to the Client, including intellectual property rights of any deliverable which Client finds unacceptable and for which it refuses payment.

V. DURATION OF THE ASSIGNMENT

The estimated period for providing the services is thirty (30) calendar months after Commencement of Services, but in any case, the Assignment ends one month after issuing of Final Payment Certificate of the Contractor.

The Commencement of Services is expected in November 2023 for the pre-construction phase, followed by the 24-month construction phase. The Commencement of Works is expected in May 2024.

VI. CONSULTANT FIRM'S MINIMUM QUALIFICATION AND EXPERIENCES

The project management service can be performed by a legal entity or a natural person who is a craftsman, registered for preforming the project management activities for infrastructure and employing one project manager (in the stage of evaluation of the expression of interest, it is sufficient to prove that the Consultant has the project manager at his disposal). Healthcare infrastructure experience will provide additional advantages. The Consultant shall be a firm or association of firms in the form of a joint venture or sub consultancy with following qualifications (in case of joint venture only the experience of lead Consultant firm and joint venture members is considered for evaluation of Expressions of Interest). A maximum of 10 references shall be provided demonstrating the following experience:

- proven general experience in providing services related to construction works (e.g., construction project management, technical consulting services, works supervision, design services etc.) for the last ten (10) years;
- proven experience related to the performance of similar services (construction project management or technical consulting services) for at least two (2) design and construction projects in the last nine (9) years with investment volumes of at least EUR 30 million.

Projects related to design, construction or reconstruction works of non-residential buildings[1] are considered more relevant;

- experience in similar services (construction project management or technical consulting services) for hospital facilities/buildings (public or private) or other health sector buildings in the last ten (10) years is considered as a significant advantage. Projects which are considered relevant are investments for such facilities/buildings of at least total gross area of 30.000 m^2;
- experience in providing legal advisory services for construction works in the last seven (7) years are considered as advantage. Experience with legal advisory for infrastructure projects under FIDIC Conditions of Contract for Construction (specifically the Red Book) and with projects with an investment volume of at least EUR 30 million, are considered a significant advantage;
- due to complexity of legal framework of the project, the Consultant (joint venture leader or member in case of association) shall have experience with providing services within European directives legal framework. Specific experience in Croatia is considered an advantage.

The credibility of mentioned experience shall be presented in a list of project references within last above required period for each requirement with description of services provided (including information on contract value, contracting entity/client, project location/country, period of providing the services, value of investment, percentage carried out by consultant in case of association of firms or subcontracting and main activities).

Consultants may associate with other firms to enhance their qualifications but should indicate clearly whether the association is in the form of a joint venture and/or a sub-consultancy. In the case of a joint venture, all the partners in the joint venture shall be jointly and severally liable for the entire contract, if selected. If the formation of an association is proposed, the rationale for, and benefits to the assignment of, the arrangement should be explained (outline proposed management coordination of the arrangement, including the role of each firm). Joint venture qualification parameters will be considered as a sum of individual qualifications of joint venture members.

Conditions and Requirements that Must be Fulfilled in Accordance with Special Regulations or Professional Rules

Every Consultant that will perform those activities for the execution of the Contract, for which by special regulations and/or professional rules of the state on whose territory the service is

[1] *non-residential buildings are buildings which have no residential area or that area is less than 50% of the total usable floor area of a residential building). For purposes of evaluation of this requirement non- residential buildings are following buildings from the National Classification of Building Types: 121 Hotels and similar buildings, 122 Office buildings, 123 Wholesale and retail stores, 126 Buildings for cultural arts and entertainment, education, hospitals and other buildings for health care, according to the National Classification of Building Types - NKVG 12. 2001 - Methodological Instructions, no. 41, ISBN 953-6667-33-0. 2002 D28*

performed, certain requirements are established as a precondition for the right to perform the same, must after the successful negotiations, and before Contract signing, fulfill all prescribed requirements and provide evidence of their fulfillment to the Client.

The activity of the construction project management is prescribed by Article 33 of the Law on the Physical Planning and Civil Works and Activities (*OG 78/15, 118/18, 110/19*).

Pursuant to Article 35 of the Law on the Physical Planning and Civil Works and Activities, the Consultant must have at his disposal a person who has the professional qualifications of an authorized project manager for executing activities of construction project management.

Pursuant to Article 37 of the Law on the Physical Planning and Civil Works and Activities, a person with education in the scientific field of: architecture and urban planning, construction, mechanical engineering, and electrical engineering profession, which meets the requirements of this Article 37 (qualifications also listed in paragraph VII of this TOR) can be appointed as construction project manager.

The areas of technical sciences are defined in the Ordinance on Scientific and Artistic Areas, Fields and Branches *OG 118/09, 82/12 and 32/13, 34/16*).

The Client will after the successful negotiations, but before Contract signing, ask the Consultant to provide evidence, if such evidence was not submitted in earlier stages of this selection process, i.e., documents, by which the selected Consultant proves that it has at its disposal (regardless of whether it belongs directly to the Consultant) an expert who meets the requirements in accordance with special regulations.

VII. TEAM COMPOSITION AND QUALIFICATIONS OF KEY EXPERTS

It is expected that the core team shall comprise of following key experts who meet listed qualification criteria:

Position K-1: Construction Project Manager/Construction Engineer:

General Qualifications:

- no less than eight (8) years of work experience with relevant tasks (experience in multiple countries will be considered a significant advantage) and a degree in the scientific area of technical sciences in one of the following scientific fields: architecture and urban planning, civil, electrical or mechanical engineering, having completed the undergraduate and graduate degree or an integrated undergraduate and graduate degree conferring the title of the master of science, master of engineering or having successfully completed the corresponding specialized graduate study from the afore-mentioned fields, conferring the title of specialist engineer, if he or she acquired during the studies no less than 300 ECTS points or a relevant educational degree in any other way stipulated by regulations and having the required knowledge from the project management field;

- knowledge in project management which is proven by:
  - project management experience in construction (construction of healthcare facilities will be considered a significant advantage) or certificate in accordance with the Rulebook on the project management know-how (*OG no. 85/15*);
  - or education in the field of architecture, civil engineering, electrical engineering, or mechanical engineering with an educational program that includes at least 30 ECTS points from the areas of relevance for the construction project management in accordance with the Rulebook on the project management know-how (*OG no. 85/15*).

Adequacy for the Assignment:

- minimum of two (2) references in performing of construction project management services with an investment value of more than EUR 30 million (hospital experience will be considered a significant advantage). Relevant experience in each project shall include the implementation of works contract under FIDIC General and Specific Conditions;
- performing construction project management services for at least one building project with an area larger than 40.000 m^2 (hospital building experience will be considered a significant advantage);
- knowledge of FIDIC standards and procedures, or World Bank provided General Conditions of Contract for works.

Experience in the Region and Language:

- experience with providing construction related services within European directives legal framework and metric system is mandatory;
- excellent verbal and written communication skills in English are mandatory;
- spoken and written communication skills in Croatian are considered as advantage;
- advanced computer skills of using Microsoft Office, AutoCAD, BIM and project planning software.

Position K-2: Legal Advisor

General Qualifications:

- university degree in law;
- at least fifteen (15) years' experience of practicing law.

Adequacy for the Assignment:

- at least ten (10) years of experience with relevant tasks i.e., experience in drafting, reviewing, negotiating and advising on construction contracts and related legal issues, such as procurement, tendering, dispute resolution, claims management and risk mitigation;
- specific knowledge in the construction law, active application of FIDIC red book is mandatory;

- member of DAB/DAAB would be an advantage.

Experience in the Region and Language:

- experience with providing legal services within European directives legal framework is mandatory; experience in Croatia will be considered as advantage;
- excellent verbal and written communication skills in English are mandatory;
- spoken and written communication skills in Croatian are considered as advantage.

Position K-3: Deputy Construction Project Manager

General Qualifications:

- university degree in architecture, engineering, business or similar;
- at least fifteen (15) years' experience in construction projects (experience in construction of healthcare facilities will be considered a significant advantage).

Adequacy for the Assignment:

- at least fifteen (15) years of experience in relevant tasks such as design management, tendering and construction management; experience in hospital projects of similar size and in multiple countries will be considered of significant advantage;
- knowledge of FIDIC standards and procedures and BIM tooling;
- advanced computer skills of using Microsoft Office, AutoCAD, and communication software.

Experience in the Region and Language:

- experience with providing infrastructure related services within European directives legal framework and metric system is mandatory; hospital experience will be considered of significant advantage;
- excellent verbal and written communication skills in English are mandatory;
- spoken and written communication skills in Croatian are considered as advantage;
- advanced computer skills of using Microsoft Office, AutoCAD, BIM and project planning software.

In addition to the Key Experts, the Consultant's team will have access to additional experts required to perform the Tasks, such as a Mechanical/HVAC Engineer, an Electrical Engineer, and an Administrator. Since these additional experts have a limited role, they will not be evaluated for shortlisting or technical evaluation purposes. However, before engaging them during contract execution, the Consultant must nominate them and obtain approval from the Client.

In addition to the minimal required project staff defined above, the Consultant shall assess and provide other supporting and administrative staff and shall include them in Consultant's proposal and work time estimation. Key experts may be from any of the joint venture members or subcontractors (or engaged otherwise by the lead company).

The Consultant shall ensure that the above positions provide continuous coverage of the project team and regular availability on site during implementation of the assignment.

VIII. INPUT DOCUMENTS AND SUPPORT TO BE PROVIDED BY THE CLIENT

Input documents provided by the Client is Design documentation of the Rebro Phase III project in the .pdf, scanned contracts for all activities relevant to this assignment, and any other documentation relevant and necessary to the Consultant's execution of tasks.

The Consultant shall return to the Client all hard copy documents if any received from the Client following the completion of the services.

The Client shall be responsible for the coordination of all project activities. The Client shall appoint Authorized Representatives, who will have the overall responsibility for the implementation of contract activities. The Consultant shall submit all deliverables to the PIU 1.

The Client will ensure that sufficient office space is provided to the Consultant within the hospital premises.

IX. OFFICIAL LANGUAGE

The language for communication and for project deliverables shall be English. Reports shall be written in English language and each report (Inception Report, Monthly Report, Specific Reports, Final Report) shall have one-page summary in the Croatian language.

X. LIST OF ANNEXES

ANNEX 1 – Conceptual Design

ANNEX 2 – Main Design (pending approval)

ANNEX 3 – Terms of Reference for Consultancy Services for Conceptual Design Review, Main Design, Detail Design and Bidding Document Development, and Design Supervision Service During Construction Phase for Clinic Hospital Center Zagreb (including amendments)

ANNEX 4 – Exchange Information Requirements (EIR)

1. INTRODUCTION

Building Information Modeling (BIM) is a process for creating and managing information on a construction project throughout its whole life cycle. In doing so, BIM model is the basis of BIM process which represents physical and functional characteristics of a facility. Thus, BIM model integrates all the graphical and non-graphical data and enables a centralized repository as well as place for sharing information among project stakeholders. The Client demands BIM usage on this project to enable improved design and construction coordination and collaboration; cost and risk reduction; space and facilities management.

1.1. Document purpose

The Exchange Information Requirements (EIR) is an important element of BIM implementation on the project level and is used to set out clearly to the project team what information (models, documents, and data) is required at each stage of the project. The project BIM Execution Plan (BEP) will provide a detailed account of how the deliverables stated in the EIR are to be achieved and elaboration of each team member's responsibility.

Consultant shall adopt BIM for the project planning, monitoring, and controlling, ensuring that all deliverables are in full compliance with the clauses of this EIR to achieve the objective to the satisfaction of the Client. Consultant shall cooperate and work closely with other project parties and the Client and its's representatives to ensure that the works and deliverables are in full compliance with the specified requirements of BIM and that the deliverables are submitted on time, high quality and within budget.

1.2. Responding to this document (EIR)

This EIR should be responded via the pre-appointment and post-appointment BIM Execution Plan (BEP). Thus, the BEP is a direct response to the EIR. The pre-appointment BEP must be prepared by shortlisted Consultants during the preparation of their Technical Proposals (in the phase which takes place after evaluation of Expressions of Interest) while the post-appointment BEP is produced 15 days after Commencement of Services only by the contracted Consultant (as stated in previous section of this ToR). Therefore, any reference to the pre-appointment BEP in this document relates to the phase of preparation of Technical Proposals and all requirements on preparing the pre-appointment BEP will be part of the Request for Proposal (which is issued to shortlisted Consultants).

1.3. General Project Information

General project information is stated in the first paragraph of ToR (I. Project Background).

2. INFORMATION MANAGEMENT

In this section general requirements for information management are stated.

2.1. Standards and classification

The relevant standards for BIM usage on the project are listed below:

1. HRN EN ISO 19650-1:2019 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -- Information management using building information modelling -- Part 1: Concepts and principles (ISO 19650-1:2018; EN ISO 19650-1:2018).
2. HRN EN ISO 19650-2:2019 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -- Information management using building information modelling -- Part 2: Delivery phase of the assets (ISO 19650-2:2018; EN ISO 19650-2:2018).
3. HRN EN ISO 19650-3:2020 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -- Information management using building information modelling -- Part 3: Operational phase of the assets (ISO 19650-3:2020; EN ISO 19650-3:2020).
4. HRN EN ISO 19650-4:2022 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -- Information management using building information modelling -- Part 4: Information exchange (ISO 19650-4:2022; EN ISO 19650-4:2022).
5. HRN EN ISO 19650-5: 2020 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) -- Information management using building information modelling -- Part 5: Security-minded approach to information management (ISO 19650-5:2020; EN ISO 19650-5:2020).
6. HRN EN ISO 16739: 2016 Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries (ISO 16739:2013; EN ISO 16739:2016)
7. HRN EN ISO 16739-1:2020 Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries -- Part 1: Data schema (ISO 16739-1:2018; EN ISO 16739-1:2020).
8. HRN EN ISO 29481-1:2017 Building information models -- Information delivery manual -- Part 1: Methodology and format (ISO 29481-1:2016; EN ISO 29481-1:2017).
9. HRN EN ISO 29481-2:2016 Building information models -- Information delivery manual -- Part 2: Interaction framework (ISO 29481-2:2012; EN ISO 29481-2:2016).
10. HRN EN ISO 12006-3:2016 Building construction -- Organization of information about construction works -- Part 3: Framework for object-oriented information (ISO 12006-3:2007; EN ISO 12006-3:2016).

11. HRN EN ISO 23386:2020 Building information modelling and other digital processes used in construction -- Methodology to describe, author and maintain properties in interconnected data dictionaries (ISO 23386:2020; EN ISO 23386:2020)
12. HRN EN ISO 23387:2020 Building Information Modelling (BIM) -- Data templates for construction objects used in the life cycle of any built asset -- Concepts and principles (ISO 23387:2020; EN ISO 23387:2020).
13. ISO 15686-4:2014 Building Construction — Service Life Planning — Part 4: Service Life Planning using Building Information Modelling.
14. BS 1192-4:2014 Collaborative production of information Part 4: Fulfilling employer's information exchange requirements using COBie – Code of practice.
15. http://docs.buildingsmartalliance.org/MVD_COBIE/.
16. HRN EN ISO 17412-1:2020 Building Information Modelling -- Level of Information Need -- Part 1: Concepts and principles (EN 17412-1:2020).
17. HRN EN ISO 12006-2:2020 Building construction -- Organization of information about construction works -- Part 2: Framework for classification (ISO 12006-2:2015; EN ISO 12006-2:2020).

Classification system which is used on this project is OmniClass (https://www.csiresources.org/standards/omniclass/standards-omniclass-about).

2.2. BIM uses

The BIM uses in the construction phase are listed below:

1. 4D construction and site planning is a process in which a 4D model (3D model with the added dimension of time) is utilized to effectively plan and show the construction sequence.
2. 5D cost estimation is a process in which a 5D model (3D model with the added dimension of cost) is utilized to effectively estimates project costs. This process allows to see the cost effects of their changes, during all phases of the project, which can help curb excessive budget overruns due to the project modifications.
3. Field BIM is a process of representing how 3D models and related databases are accessed on the construction site. Through a tablet, laptop, smart phone or wearable equipment, the user would inspect designs, send requests for clarifications, mark drawings/models, complete a checklist, report an issue, or conduct information-rich, site-based activities.
4. Monitoring, reporting and controlling is a process of actively and continuously collecting, processing, storage and presenting information, reviewing the status of project, evaluating potential obstacles, and implementing necessary changes using adequate BIM software.
5. Drawing generation is a process of using BIM to produce 2D drawings while all 2D drawings shall be generated from the BIM authoring software and tools directly.

6. Quantity Take-Offs (QTO) generation is a process in which BIM is used to assist in the generation of accurate QTO and Bill of Quantities (BoQ).
7. Code validation is a process in which code validation software is utilized to check the model parameters against project specific codes.
8. Model coordination/Clash detection is a process in which model elements are analysed using clash detection software to detect potential conflicts in design to update the design and eliminate potential system collisions prior to starting on site. In the construction phase this is mainly related to the 4D clash detection which is a process of identifying clashes related to the contractor scheduling, other construction sites within the complex, etc.
9. As-constructed representation is a process of generation of 3D BIM As-Built Models using semi-automated processes.

2.3. Common Data Environment (CDE) establishment and implementation

The Common Data Environment (CDE) is a means of allowing information to be shared efficiently and accurately between all members of the project team –including graphical information (2D and 3D), models, non-graphical information, or documentation. Consultant shall establish (implement, configure and support) the project's CDE to serve the overall requirements of the project and to support the collaborative production of information.

Licenses and BIM training for all stakeholders will be provided by the Client and this is not part of this consultancy services. Consultant must manage, monitor, and control the project CDE. CDE establishment and implementation methodology shall be stated in the BIM Execution Plan. It is important to note that all versions of the data in CDE (BIM models, project information, reports, drawings, etc.) are the property of the Client.

Structure for CDE for construction phase shall be defined in coordination with the Client and after approval of the structure, CDE shall be established and implemented. Structure of CDE shall enable the collaboration and data exchange between all project stakeholders (e.g., Beneficiary, Client, Designer, Contractor, Supervising Engineer, FIDIC Engineer, and Construction Project Manager). After CDE establishment, the Consultant shall provide technical assistance to the Client during CDE implementation.

A CDE shall be implemented according to the requirements in the ToR and be utilised throughout the project stages specified by the Client. Individual login accounts with appropriate permissions for each person using the CDE shall be provided to the involved project stakeholders. Consultant also have responsibilities for testing established CDE.

The project's CDE shall:

- enable each information container to have a unique ID, based upon an agreed and documented convention comprised of fields separated by a delimiter;
- enable each field to be assigned a value from an agreed and documented codification standard;
- provide a workflow for managing information process including status, revisions, and authorization control;
- provide a user-customisable workflow for document submission and approval;
- enable each information container to have the following attributes assigned: status (suitability), revision, authorization, and classification (in accordance with the framework defined in ISO 12006-2);
- enable the ability for information containers to transition between states;
- enable the recording of the name of user and date when information container revisions transition between each state;
- enable controlled access (security) at an information container level;
- provide data storage in a secure cloud-based or on-premises environment;
- provide a user-customisable security access right control and management system;
- provide a user-customisable sectional / categorizable structure;
- support uploading, downloading, information models and documentation to facilitate retrieval of document attributes to support the CDE processes, including as a minimum – the document identifier (number), title, revision, version, and status codes (suitability);
- support review, comment, and mark-up procedures for information models and documentation formats in the agreed proprietary and open file delivery formats and versions as documented in the BEP;
- allow access from portable devices and web applications;
- contained encryption for data security;
- provide sufficient capacity to store all files throughout the project stages;
- installed with anti-virus software and maintained with updated security patches by the operating system or environment that the CDE resides on;
- provide dashboards for presenting the BIM progress information to the different levels of users;
- provide an issue tracking system, including the issue registration, logging, update, and email notification to the selected user account;
- provide off-site backup of all project files including information models, documents, and data;
- provide a feature of project archive that all project files and information shall be archived in Client's preferred media and transferred to the Client upon the completion of the design stage and construction stage respectively or as and when requested by the Client during the contract period;
- provide a full audit trail of the information stored in the CDE.

When defining CDE implementation strategy within the BEP, standard for metadata including structure of folders, status codes, revision codes, authorization codes, and classification code should be proposed. Proposed standards must be in accordance with the ISO 19650 series of standards. Overview of the CDE implementation strategy must be proposed in pre-appointment BEP, while detail establishment and implementation process will agree in post-appointment BEP. In doing so, the CDE must contain four identified functional sections: work in progress (WIP), shared, published, and archive, as well as enable the collaboration and data exchange between all project stakeholders in appropriate and secure manner.

2.4. Security

The project BEP should set out the process for monitoring, managing, and complying with the Client security mandate, including adherence to any standard or processes for data sharing. The following security standards should be followed in respect of the proposed BIM project, defined in accordance with the business impact levels (Not Protectively Marked, Protected Restricted, Confidential). All the information about the project must not be shared with third parties and must be considered as confidential, until the Client decides otherwise.

A data security protocol should be established to prevent any possible data corruption, virus infections, and data misuse or deliberate damage by project team members, other employees, or outside sources. Adequate user access rights should be established to prevent data loss or damage during file exchange, maintenance, and archiving. BIM project data residing on network servers should be subjected to regular back-ups. Proposed data security protocol must be in accordance with the ISO 19650 series of standards.

All supply chain organisations are required to adopt the security requirements as detailed in the post-appointment BEP.

- all project information must be shared via the project CDE;
- the use of CDs, USB drives is not permitted;
- the use of other online document exchange tools is not permitted;
- project documents must not be shared via email;
- all CDE users must have their own username and password;
- the Consultant have confirmed their company security standards as part of the BIM Capability Assessment.

2.5. Planning of work and data segregation

The Model Federation Strategy for design phase has been developed by the Designer and information in the BIM model has been organised in line with the agreed Strategy. Hospital

Building, Open Garage with Helipad and Access Road with Landscaping have been developed in BIM environment, while Central Heating Station has been developed using CAD software.

To effectively manage the information model during construction phase, it needs to be divided into its component parts. This is defined as an information breakdown structure which is a pre-determined method to identify manageable units of information to be used across a project life cycle. Information breakdown structure (including WBS and CBS) shall enable properly segregation of the 4D and 5D BIM models and should include all the necessary element attributes and properties, to be ready for the accompanying BIM uses, but also to be usable for the further project phases. The high-level breakdown starts at the four identified sections (mentioned before) of an information model which are graphical model, non-graphical information, and documentation. Organization of the information in the BIM model should relate to the requirements related to required Level of Information Needed (specified in addition).

Agreed information breakdown structure shall be used during project implementation by all project stakeholders and all project deliverables shall be in line with the defined structure.

2.6. BIM Personnel

There are commonly two key roles in a project with BIM adoption namely BIM Manager and CDE/Data/Document Manager.

1. The BIM Manager shall take lead on the BIM execution and oversee the BIM process of the project. It should be ensured that the BIM Manager shall work independently from the other respective project leaders. It is desirable that the named BIM Manager has a minimum university degree (or equivalent) in an appropriate architectural, engineering, surveying, building or construction-related discipline and minimum of one years of practical experience in management of BIM projects of similar BIM requirements.

2. CDE/Data/Document Manager shall:
    a. design and manage the CDE including processes and procedures;
    b. establish, agree, and implement the rules of the information structure and manage the standards for the information model;
    c. ensure compliance with information requirements and provide support on non-compliance;
    d. manage the information model to meet integrity and security standards in accordance with the requirements of the EIR and agreed post-appointment BEP;
    e. be a point of reference for all data/information management problems on the project;
    f. make sure that all the information produced, and the model attributes are compatible with the standard methods and procedures of the project;

g. provide clear instructions to the project team on what information is requested, by whom and for what purpose, who will generate and manage the information, how often and what actions must be taken upon receipt of the information;
h. ensure that information and documents are strictly controlled and efficiently disseminated between the parties envisaged through the CDE;
i. customize and keep the collaborative platform updated, manage documents and service users;
j. ensure adequate transmission of documents.

It is desirable that the named CDE/Data/Document Manager has a minimum one year of practical experience in CDE implementation and management.

Further, when defining BIM Personnel, it is required that Consultant specify roles, and responsibilities for all project staff, including Key Experts and key BIM personnel (BIM Manager and CDE/Data/Document Manager).

Thus, in pre-appointment BEP should be given proposed organisation breakdown structure of delivery team and delivery team capability and capacity assessment.

All Key Experts, BIM Manager, CDE/Data/Document Manager, and additional staff shall be included in organizational breakdown structure defined in pre-appointment BEP and post-appointment BEP according to the requirements in the ToR and EIR. It is not required to appoint or name the BIM Manager and CDE/Data/Document Manager in the Expression of Interest or in the Technical Proposal, but it is mandatory that they are appointed and approved by the Client at least seven (7) days after Commencement of Services.

2.7. Collaboration process

The success of a BIM enabled project delivery process is highly dependent upon the level at which the entire project team can collaboratively produce and manage information for the duration of the project. The project collaboration process shall be outlined in the pre-appointment BEP and should be sufficient to demonstrate competence and capability, while in post-appointment BEP details of collaboration process should be presented. All processes must follow ISO 19650 standard series, utilising the described information exchange through the CDE.

In doing so, it is recommended to use open data standards such as BIM Collaboration Format (BCF) used to exchange snippets of models with comment and mark-up can aid in this process whilst providing an audit trail of issues and resolutions.

The pre-appointment BEP response should include as a minimum detail of:

- description of the roles and relationships of the subjects involved in the project (recommended using flow diagrams);
- frequency and formats of information exchanges;
- format and extent of model sharing at every stage of the project;
- frequency and details of model reviews (including model review workshops and other collaborative working practices).

2.8. Coordination process

Project quality and de-risking through model and information co-ordination is a key objective and requirement from Client. Proposal for Information Delivery Strategy should be part of pre-appointment BEP. Information Delivery Strategy shall include presentation of strategy for generation of all project deliverables and coordination process with all relevant project stakeholders.

2.9. Compliance plan

Compliance plan should include:

1. Quality Assurance Plan
   - Quality Assurance Plan shall be included as part of the project information production methods and procedures in the BEP, outlining the quality assurance for the BIM process, BIM compliance and asset attributes checking. Quality Assurance Plan for BIM shall be established to ensure appropriate quality control on information and data accuracy.
2. Compliance check of project deliverables
   - Compliance check of the deliverables shall be done before every submission by the personnel (recommended BIM personnel) of the Consultant working on the project and other personnel (recommended BIM personnel) of the Consultant independent from the project team.

2.10. Training requirements

The BIM Personnel included in project delivery must have adequate BIM knowledge and skills. BIM training for CDE and BIM software for construction and project management (4D/5D BIM software) for all stakeholders will be provided by the Client and this is not part of this consultancy services.

2.11. Health and safety

BIM process should support the project health and safety. This includes the utilisation of BIM to identify and reduce health and safety hazards/risks in construction phase through early

identification and mitigation. Residual hazards/risks should be communicated through the CDE and where possible within the model environment.

The post-appointment BEP shall include the following to demonstrate capability and competency:

- schedule of work stages and overview of key health and safety deliverables against each stage;
- confirmation of how information shall be stored and shared;
- requirements for disaster planning;
- approach to design authoring and model interrogation.

The model development and structured delivery of information should enable the following:

- construction coordination;
- site logistics and site safety, plant and pedestrian segregation, traffic, and delivery management;
- installation management checklists;
- visual method statements;
- access to the BIM model by all project stakeholders including subcontractors on site;
- completion of the health and safety file and asset information for training etc.

3. TECHNICAL MANAGEMENT

In this section general requirements for technical management are stated.

3.1. Hardware and software requirements

The requirements for the software, hardware and network bandwidth for BIM uses delivery on workstation, desktop, notebook computers and mobile devices should be determined. The minimum requirement varies for different applications, project sizes and operating systems. The actual needs of a project must be determined on a case-by-case basis. The hardware and software to be used shall enable the project participants to deliver the required BIM uses in a productive and efficient manner. The specification and functional performance of the hardware shall refer to the requirements of the software to be adopted in the project. Thus, this section communicates any constraints or specific IT requirements, which may need additional resources or non-standard solutions.

The Consultant shall provide hardware specification inclusive desktop, notebook computers, mobile devices, BIM data servers, workstations and viewing platforms, etc. The specifications should include recommendations for the operating system, CPU, memory, video cards, hard disk space and network speeds. The following hardware specification should be considered in post-appointment BEP.

Further, the Consultant should identify versions of licensed operating systems as well as other IT limitations as these can all impact the software versions to be used. To allow interoperability, the BIM tools should be compliant with open data exchanges such as IFC. Also, inherent model data must be extractable in a .xls (or similar) format for information exchange purposes. In post-appointment BEP should also be stated the type of software which will be used to meet required BIM uses.

All deliverables according to project specific EIR for BIM shall comply with the hardware specifications and software versions provided by the Client during the contract period and at the time of delivery. The Consultant shall plan, manage, and supervise the processes for the upgrading of software and hardware changes throughout the project and shall indicate the cost in their tender submissions if any upgrade is needed during the contract period.

Licences for CDE and for BIM software for construction and project management (4D/5D BIM software) for all stakeholders (including updates) will be provided by the Client and this is not part of this consultancy services. This software shall be included in the post-appointment BEP.

3.2. Data exchange formats

The BIM software which will be used for BIM uses delivery shall support open format (include import and export). The version of IFC format which is acceptable is IFC2x3 or higher (if required for construction management domain).

The required delivery formats for graphical data, non-graphical data and documentation defined for this project (design and construction phases) are outlined below:

- graphical data — native formats, .ifc (if applicable)
- 2D graphical data — .pdf, .dwg
- non-graphical data — .ifc, .xlsx (COBie data format), .mpp
- documentation — .pdf, .doc

Method of data exchange is CDE as stated in previous text in this document. The delivery team should identify and document their proprietary formats, open formats, and maximum file size to facilitate the flow of data and allow easier management of information within the post-appointment BEP.

3.3. Levels and coordinates

In the design phase project levels and coordinates have been set up by the Designer, while in the construction phase Contractor will be obligated to deliver accurate 4D and 5D BIM models. The Consultant is obligated to inform the Client if there is some inconsistent information in the models

related to the levels and coordinates which will prevent him from performing tasks within the scope of his contract.

3.4. Level of Information Need (LOIN)

Level of Information Need (LOIN) is used to describe model elements and not models as a whole. An element has only progressed to a given LOIN when all the stated requirements have been met. According to ISO 17412-1 the LOIN refers to the three components of the information model which are graphics, information, and documentation. Graphics refers to the graphical representation which deals with geometric representation, symbology, and visualisation and in this project should be analysed. Information identifies the properties (requirements, specifications, product definitions, object methods, parametric parameters, materials, generic or manufactured product criteria, etc.) to be attached to each type of object to meet the intended uses. Documentation identifies the properties to be attached to each type of object to meet the intended uses.

Level of detail and level of information for design phase (Main and Detail Design) has been defined during LOD specification matrix and model element library development. Detail Design (including models in appropriate level of detail and level of information and Bill of Quantities) will be provided by the Client and will be input data for the construction phase.

Level of Information Need for time schedule as well as 4D and 5D BIM models will be defined during information breakdown structure definition.

4. COMMERCIAL MANAGEMENT

In this section general requirements for commercial management are stated.

4.1. Information exchange

The Client must communicate the timing and content complete information exchanges between the delivery team and Client. Further, information exchanges should be aligned with work stages. Through the different stages, it is necessary that all the information exchange should happen within a CDE.

At a project level, the frequency of required information exchanges should be defined in the post-appointment BEP (within the project Master Information Delivery Plan – MIDP) and should be in accordance with the specified data exchange formats, milestones, and defined project deliverables.

For the entire duration of the contract, the lead Consultant is responsible for adequacy and compliance of information exchanged by any sub-Consultant with the contents of this document.

4.2. Project deliverables (related to the BIM environment)

The required project deliverables are listed below (requirements for each project deliverable have been stated in previous part of this document):

1. pre-appointment BEP;
2. post-appointment BEP;
3. monthly report (including native file from BIM software).

When preparing monthly reports, the Consultant is obligated to perform Earned Value Analyses (EVA) based on Contractor's 4D/5D BIM models using adequate BIM software (4D/5D) that enables BIM uses delivery. Monthly reports shall be extracted from BIM software and native file shall also be submitted.

4.3. Ownership of the data in CDE

During the project, the Consultant must produce, in addition to the documentation, all the files in native format and in the related exchange formats (e.g., IFC) with the relative copyrights, to allow Client any future revisions of the same. All versions of the data in CDE (BIM models, project information, reports, drawings, etc.) are the property of the Client. Furthermore, all project deliverables shall be in accordance with the law and the requirements included in other contractual documents (inclusive EIR).

4.4. Acceptance criteria

Acceptance criteria are defined in previous sections in the ToR.

4.5. Responsibilities matrix

The purpose of this section is to bring to the attention of the project team the allocation of roles associated with the management of project information (including models, documentation, etc.). Consultant shall identify (within an Information Management Service Matrix) the information management roles and assigned to them the information management functions (including all relevant stakeholders which will have access to the CDE). The matrix shall identify at least a simplified approach of which of the roles is responsible for each task, by indicating a tick or cross against the matrix. The tasks should be allocated using a full RACI responsibility service approach indicating either:

- Responsible for undertaking activity (R);
- Accountable for activity completion (A);
- Consulted during activity (C);
- Informed following activity completion (I).

In doing so, Consultant shall define project delivery and information management roles for construction phase within pre-appointment BEP. In post-appointment BEP, the responsibilities

matrix shall be updated with the names and contact details of the individuals fulfilling the necessary project roles. The authorities for the different roles related to the production and management of information models shall be defined in the responsibility matrix.

4.6. BIM capability and capacity assessment

The Consultant shall provide a capability summary assessment along with a proposed risk register and mobilisation plan. The assessment must be part of pre-appointment BEP and shall include:

- details of BIM workload and resourcing;
- proposed approach;
- BIM capability assessment;
- Information and Communication Technologies (ICT) capability assessment;
- information delivery capability assessment;
- capacity assessment;
- security assessment.

Where delivery and task teams do not have the appropriate skills, software, or resource available, this should be mitigated through risk assessment, procurement, and training preferably through the mobilisation stage. Any identified risks would be carried through to the Risk register and where possible, mitigated through the mobilisation activity.