REPUBLIC OF CROATIA

MINISTRY OF PHYSICAL PLANNING, CONSTRUCTION AND STATE ASSETS

EARTHQUAKE RECOVERY AND PUBLIC HEALTH PREPAREDNESS PROJECT

TERMS OF REFERENCE FOR SUPERVISION OF WORKS SERVICES FOR CLINIC HOSPITAL CENTER ZAGREB – REBRO PHASE III

Proc.ref.no.: MoPPCSA/ER&PHPP/C1.2.4/CS-QBS

I. PROJECT BACKGROUND

The Republic of Croatia (RoC) with financing form 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). 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 basement, 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 previous 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.

First version of Conceptual Design for CHC Zagreb hospital has been completed in January 2021 by Gradit 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, which was completed in April 2023 when a request for obtaining amendments to the Location Permit has been submitted. Main Design **(ANNEX 1)** was completed in July 2023, 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 and will be established for construction phase, before the commencement of works.

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 objective of the services is professional works supervision over the construction works on CHC Zagreb Rebro Phase III[1] which includes:

- reconstruction and upgrade of hospital building;
- construction of new open garage with helipad;
- reconstruction of access road;
- reconstruction of central heating station[2].

carried out in full compliance with the FIDIC Red Book (Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer, Second Edition 2017)

[1] Professional works supervision over Phase 2 of the CHC Zagreb Rebro Phase III project (installation of two medium voltage cables and installation of substation equipment) is excluded from this Assignment.

[2] Reconstruction of central heating station is not part of Phase III project but is included in works contract and this contract respectively.

(hereinafter, Works Contract), this Agreement and relevant legislation of the Republic of Croatia (hereinafter, the Assignment). Consultant shall act as Engineer under Works Contract.

According to article 3.1 of the General Conditions of the above-mentioned Works Contract, the Client shall appoint the Engineer who shall carry out the duties assigned to him in the Works Contract. The Engineer shall be vested with all the authority necessary to act as the Engineer under the Works Contract.

The Consultant's staff shall include suitably qualified engineers, i.e., supervising engineers, and other professionals who are competent to carry out these duties, as well as the supervision of works services.

Supervision of works consists of professional construction supervision according to the Construction Act (*OG 153/13, 20/17, 39/19, 125/19*), Act on activities in Physical Planning and Civil Works (*OG 78/15, 118/18, 110/19*) and any relevant subsidiary legislation. The Assignment also includes ensuring the fulfillment of Contractor's contractual obligations to the Client.

According to Construction Act, the supervising engineer is in the implementation of professional supervision of works obliged to:

- supervise the construction so that it is in accordance with the building permit, ie the main design, Construction Act, special regulations and rules of the profession;
- determine whether the Contractor and the responsible person conducting the construction or works meets the conditions prescribed by a special act;
- determine whether the setting out of the building was performed by a person authorized to perform state survey and real estate cadastre activities according to a special act;
- determine the implementation of control tests of certain parts of the building for the purpose of verification, ie proof of compliance of basic requirements for construction and/or other requirements, ie conditions provided by the main design or report on performed design control and verification obligations regarding construction products;
- without delay inform the investor of all deficiencies or irregularities noticed in the main design and during construction, and the investor and the construction inspection and other inspections of measures taken;
- compose a final report on the construction.

The scope of the supervision services under this contract and in addition to legal obligations includes the following:

- monitoring and controlling the spending of funds by purpose, dynamics, and amount (control of measurements, calculation of quantities, IPC's, calculation of unforeseen and subsequent/additional works);
- maintaining the agreed deadlines (determining the Commencement Date, monitoring the progress of works according to time plans and intervention in case of deviations, control of the qualification structure of the Contractor's personnel and appropriate equipment);
- monitoring and controlling quality of works (visual inspection, control, and review of documentation by which the Contractor proves quality in terms of test results and test frequency, presence when taking samples for testing, taking measures to eliminate defects);

- construction control according to building permit and detailed design (control of height and length elevations, setting out, use of materials in accordance with the project, interpretation of ambiguities in the project, solving individual details);
- other (control of data entry in the construction log, verification of IPC's, various reports and analyses, arranging documentation on the construction site for technical inspection, participation in taking over of works and other legal and other tasks if and when authorized by the Client).

III. SCOPE OF SERVICES AND TASKS

All tasks will be performed in compliance with the requirements of Croatian legislation and in accordance with the obligations of this contract.

TASK 1 Development of post-appointment BEP

Post-appointment BIM Execution Plan (BEP) is 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 Exchange Information Requirements (EIR) in **ANNEX 3** and in timely manner. Approved BEP will also serve as a procedures manual.

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 Supervision of Works

This task consists of three specific phases: (i) Preparation Phase, (ii) Execution Phase, and (iii) Completion Phase. Below are given tasks for each phase the Engineer is obliged to perform (but not limited to). Phases may intertwine.

Preparation Phase

Preparation phase implies the period between conclusion of this contract and the Commencement of Works according to Sub-clause 8.1 of the General and Particular Conditions (GCC and PCC) of the Works Contract.

During the Preparation phase the Engineer shall perform the following sub-tasks in line with the requirements defined in the EIR **(ANNEX 3):**

- establish a functional organization of experts in the supervision team and enable instant mobilization of staff to engage in the implementation of contract;
- assess the conditions on the construction site and warn the Client of potential risks in the execution of works;
- determine the Commencement Date and introduce the Contractor to works;
- assist the Client in reviewing and approving all necessary certificates, guarantees, securities, insurance policies, etc. for the start of construction works;
- review and determine the initial schedule and financial plan provided by the Contractor;
- monitor and control the preparation of administrative deliverables of the Contractor;

- review the Contractor's Documents submitted according to Sub-clause 4.4.1 of the Works Contract and any other document submitted to the Engineer;
- review the Programme submitted by the Contractor according to Sub-clause 8.3 of the Works Contract;
- review of the Contractor's BIM execution plan.

Execution phase

Execution phase implies the period between Commencement Date and issuing of the Performance Certificate. During the Execution phase the Engineer shall perform following sub-tasks in line with the requirements defined in the EIR (**ANNEX 3):**

- supervise the implementation of the Contractor's activities, and ensure their compliance with terms and conditions of the contract, quality requirements and the general scope of the project, from the conclusion of the works contract, execution of works to the implementation of Tests on Completion and Taking Over of Works;
- supervise the preparation and timely delivery of Contractor's deliverables;
- continuously review Contractor's Documents and other deliverables submitted during the execution of Works;
- carry out professional supervision over all activities of the Contractor in accordance with the applicable regulations of the Republic of Croatia;
- carry out coordination and administration of the contract;
- initiate, lead and coordinate Meetings according to Sub-clause 3.8 of the Works Contract, including any on-site and other progress meetings and prepare and issue minutes of these meetings in a timely manner and ensure that all issues are resolved quickly;
- monitor the progress of works and timely inform the Client about all risks and issues that may arise and affect the achievement of project objectives;
- verify the Construction Book[3] of the Contractor and certify the calculation of quantities submitted as executed by the Contractor, review and approve applications of interim payments;
- participate in the implementation of tests and control the installation of significant materials and equipment;
- conduct daily inspections of the construction site to check the quality of work and ensure the implementation of health and safety measures and ensure compliance with the health and safety laws and regulations;
- approve materials nominated by the Contractor for installation;
- propose possible adaptations of the project and alternative technical solutions to the Client, which may become necessary or useful during or after the execution of works;
- advise the Client on possible ways to reduce project costs, reduce execution time or improve the quality of works;
- review Contractor's Progress Reports and ensure fulfilment of reporting requirements;
- prepare reports as defined in Chapter *III.IV Reporting* of this ToR, prepare all reports in accordance with the applicable legislation of the Republic of Croatia and prepare all

[3] Construction Book is a set of template sheets on which the calculation of performed works is done.

prescribed reports for technical inspection and participate in the technical inspection procedure;

- supervise the execution of any unforeseen and subsequent works during construction;
- participate accordingly during remedying defects;
- during the execution of the works, ensure the timely collection of data and necessary scanning for the purposes of development an As-Built Design documentation;
- perform the duties of Safety at Work Coordinator in accordance with the Safety at Work Act (*OG 71/14, 118/14, 154/14, 94/18, 96/18*) and any relevant subsidiary legislation.

Completion phase

Completion phase corresponds to the period from issuing Taking-Over Certificate for Works or Section (as the case may be) until approval of Final Payment Certificate. During this phase the Engineer is required to perform following sub-tasks in line with the requirements defined in the EIR (**ANNEX 3):**

- review and approve As-Built Design documentation;
- supervise completion of any work outstanding on the relevant Date of Completion;
- supervise remediation of any identified defects;
- patricipate in any administrative activities regarding Defects after Taking-Over;
- review and approve Final Payment Certificate.

Limitations in Engineers powers

Engineer shall have the following limitations in powers, i.e. Engineer must obtain prior approval from Construction Project Manager/Client before conducting the following regulations from General and Particular Contract Conditions from works contract:

- 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.

Notwithstanding the limitations set forth above, if in the opinion of the Engineer there is an endangerment to safety of life or property or Works, he may, without liberating Contractor of any obligations or responsibilities under the Contract, instruct the Contractor to perform Works or do tasks which, in the opinion of the Engineer, are necessary to eliminate or reduce the risk.

Supervising engineers

Supervising engineers are obliged to comply with the Regulation on the manner of conducting professional construction supervision, form, conditions and manner of keeping the construction log and the content of the final report of supervising engineer (*OG 131/2021*).

Also, the obligations of supervising engineers in the implementation of professional supervision under this Contract are as follows:

- construction supervision in accordance with the Main and Detail Design and Building Permit;
- performing professional supervision in accordance with this ToR and performing tasks of coordinator of safety at work in the construction phase;
- continuous daily presence on the construction site and construction monitoring;
- control of material supply - certificates of conformity, certificates of constancy of performance, other certificates;
- monthly verification of calculation of quantities and IPC's;
- control and price evaluation for subsequent and unforeseen works;
- keeping minutes of coordination meetings;
- participation in the preparation of the final payment certificate, taking over of works, technical inspection and in the procedure of obtaining operating permits;
- preparation of photo documentation of construction progress.

All of the above sub-tasks shall be performed in line with the requirements defined in the EIR **(ANNEX 3).**

TASK 3 Compliance with ESMP

The Consultant shall ensure execution of works and implementation of this Assignment in full compliance with Environmental and Social Management Plan (ESMP). The Consultant shall ensure the implementation of all mitigation measures defined in ESMP and timely report to the Client on any identified risk or breach of compliance with ESMP.

The Consultant shall also ensure all activities will be carried out in line with the WB Environmental and Social Framework (ESF) and related documents.

ESMP for construction phase will be available upon start of bidding process for works.

TASK 4 Reporting requirements

After the Kick-off meeting the Consultant shall review all existing relevant documentation and develop Inception Report with appropriate material discussing the feasibility of the project, special problems, risks, and opportunities. Inception report shall include description of monitoring and controlling processes of the works execution, but also definition 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.

The Consultant also shall develop any other Specific Reports according to the Client's requirements whose content will be determined and agreed between the Consultant and the Client, as well as submission deadline.

At the end of the consultancy service engagement the Consultant shall develop Final Report which shall include project summary, project execution analysis, cost analysis, list of verified As-Built Designs, verified results of Tests on Completion, Reports on commissioning of various mechanical and electrical components of works and other as needed.

Reports shall be written on the English language and each report (Inception Report, Monthly Reports, Specific Reports, Final Report[4]) shall have one page summary on the Croatian language.

IV. SUBMISSION AND TIME SCHEDULE FOR DELIVERABLES

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.	Deliverable	Delivery deadline	Responsible for submitting	Responsible for reviewing and approving	Timeline for approval
1.	Inception Report	28 days after Commencement of Services	Consultant	Client	7 days after submission
2.	Post-appointment BEP	28 days after Commencement of Services	Consultant	Client	7 days after submission
3.	Monthly Report	7 days after the end of the reporting period	Consultant	Client	7 days after submission
4.	Minutes of coordination meetings	the following day	Consultant	Client	the following day
5.	Specific Report according to the Client's requirements	will be agreed	Consultant	Client	7 days after submission
6.	Final Report	Taking-Over Certificate for Works	Consultant	Client	14 days after submission

Consultant shall ensure completion of services on time and without any delay. Also, all deliverables prepared in connection with the service shall immediately upon completion 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 previously defined period in the table or any other period defined by the Client upon receiving each of the deliverables.

[4] Final Report means final report according to this ToR. This Final Report in no way coincide with the Final report of the supervising engineer (hrv. Završno izvješće nadzornog inženjera) according to Regulation on the manner of conducting professional construction supervision, form, conditions and manner of keeping the construction log and the content of the final report of supervising engineer (OG 131/2021).

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 twenty-six (26) months, which includes the period from Commencement of Services until approval of Final Payment Certificate. The Commencement of Services is expected in April 2024, while the Commencement of Works is expected in May 2024.

VI. TEAM COMPOSITION, MINIMUM QUALIFICATION AND EXPERIENCES

The Consultant shall be a firm or association of firms in the form of a joint venture or sub consultancy with following qualifications (each qualification requirement listed below is considered separately):

- proven general experience in supervision of construction works for the last ten (10) years;
- proven specific experience in supervision of construction works for at least two (2) construction projects in the last ten (10) years for investments of at least EUR 50 million (without VAT); projects including supervision over the construction or reconstruction works of non-residential buildings[5] are considered more relevant;
- experience in supervision of construction works for hospital facilities/buildings (public or private) in the last ten (10) years is considered as a significant advantage; projects which are considered relevant are investments for facilities/buildings of at least total gross area of 25.000 m^2 and projects including supervision over the construction or reconstruction works of non-residential buildings;
- experience in supervision of construction works where FIDIC Conditions of Contract for Construction were used (specifically the Red Book); the Consultant shall have at least three (3) such project references in the last ten (10) years. For this qualification requirement Client will take into consideration any construction works where FIDIC Conditions of Contract for Construction were used regardless of investment value, total gross area or type of building or construction, however advantage is given to Consultants which have references similar to this assignment;
- experience in using BIM for construction works is an advantage and Consultant should have preferably at least one (1) project reference for performing such services in the last ten (10) years;
- 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 supervision of

[5] *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*

construction works in Croatia and within European directives legal framework and metric system.

The credibility of mentioned experience shall be presented in a list of project references within last ten (10) years 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) and accompanied by certificates of orderly fulfilment of the contracts verified by other party from such contracts.

The Consultant shall have the organizational capacity (it is expected that the Consultant shall have at least twenty (20) employees/sub-contracted experts for performing activities under this service) to perform this service as well as available appropriate skills among staff. It is expected that the Consultant submits relevant information on their organizational capacity in their Expression of Interest.

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. In case of joint venture only the experience of lead Consultant firm and joint venture members is considered for evaluation of Expressions of Interest

VII. TEAM COMPOSITION AND QUALIFICATIONS OF KEY EXPERTS

Key experts must have sufficient competences, the staffing should comprise the skills and qualifications listed in this section, to fulfil the stated outputs and objectives.

Key experts may be from any of the joint venture members or subcontractors (or engaged otherwise by the lead company).

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

Position K-1: Team Leader / Engineer

General Qualifications

- university degree in civil engineering or architecture;
- minimum fifteen (15) years of general professional experience in civil engineering/architecture/construction management;

Adequacy for the Assignment

- minimum ten (10) years' experience in managing and supervising construction projects, preferably in the health care sector;

- experience in management positions for supervising construction projects, or as chief engineer during construction, for at least three (3) public6 projects in size larger than 25.000 m2; experience in hospital construction projects is a significant advantage;
- experience and skills in planning, budgeting, scheduling, quality control, safety, FIDIC contracts and risk management;
- experience in resolving disputes under FIDIC contracts within DAB/DAAB is an advantage;

Experience in the Region and Language

- experience with providing supervising service within European directives legal framework and metric system is mandatory;
- knowledge of building codes, standards, and regulations applicable in Croatia is mandatory;
- excellent verbal and written communication skills in English are mandatory;
- spoken and written communication skills in Croatian are considered as advantage.

Position K-2: Chief Supervising Engineer / Engineer's Representative

General Qualifications

- university degree in civil engineering or architecture;
- minimum fifteen (15) years of general professional experience in civil engineering/architecture/construction management;

Adequacy for the Assignment

- minimum ten (10) years' experience in supervising construction projects, preferably in the health care sector;
- experience as chief supervising civil engineer on construction projects, for at least three (3) public7 projects in size larger than 25.000 m2. Experience in hospital construction projects is a significant advantage;
- experience in minimum of three (3) projects in the design, supervision, management, or administration of large construction projects, involving FIDIC contracts in the last ten (10) years. In this case projects with investments of more than 25 million EUR are considered as large construction projects;
- experience and skills in quality control, resolving disputes, and price adjustment analysis in construction;
- working experience in BIM;

Experience in the Region and Language

- experience with providing supervising service within European directives legal framework and metric system is mandatory;

[6] *Public refers to usage, not ownership or financing.*
[7] *Public refers to usage, not ownership or financing.*

- knowledge of building codes, standards, and regulations applicable in Croatia is mandatory;
- excellent verbal and written communication skills in English are mandatory;
- spoken and written communication skills in Croatian are mandatory.

Position K-3: Mechanical Engineering Supervisor 1

General Qualifications

- university degree in mechanical engineering;
- minimum fifteen (15) years of professional experience in the related field;

Adequacy for the Assignment

- at least ten (10) years of professional experience in mechanical engineering of public buildings7 (in the design role, or supervision role or on the side of the Contractor during construction);
- experience as mechanical engineering supervisor on construction projects, for at least three (3) public7 projects in size larger than 25.000 m2;
- experience in working on hospital construction or healthcare projects is considered as a significant advantage;

Experience in the Region and Language

- experience with providing design service within European directives legal framework and metric system is mandatory;
- excellent verbal and written communication skills in English are mandatory.

Position K-4: Electrical Engineering Supervisor 1

General Qualifications

- university degree in electrical engineering;
- minimum fifteen (15) years of professional experience in the related field;

Adequacy for the Assignment

- at least ten (10) years of professional experience in electrical engineering of public buildings8 (in the design role, or supervision role or on the side of the Contractor during construction);
- experience as electrical engineering supervisor on construction projects, for at least three (3) public8 projects in size larger than 25.000 m2;
- experience in working on hospital construction or healthcare projects is considered as a significant advantage;

Experience in the Region and Language

- experience with providing design service within European directives legal framework and metric system is mandatory;
- excellent verbal and written communication skills in English are mandatory.

[8] *Public refers to usage, not ownership or financing.*

Following experts are considered non-key experts who meet listed qualification criteria:

i. **Supervising Civil Engineer 2** shall have
   - university degree in civil engineering;
   - at least ten (10) years of professional engineering experience in the field of civil engineering;
   - at least five (5) years of professional engineering experience in the civil engineering supervision;
   - working experience in BIM.

ii. **Surveying Supervising Engineer** shall have:
   - university degree in geodetic sciences;
   - at least seven (7) years of performing professional geodetic work;
   - at least five (5) years of performing professional geodetic work for construction purposes.

iii. **Geomechanics Supervising Engineer** shall have:
   - university degree in geotechnical sciences;
   - at least ten (10) years of performing professional geotechnical work;
   - at least five (5) years of performing professional geotechnical work for construction purposes.

iv. **Environmental Specialist** shall have:
   - university degree in environmental engineering or science, biology or relevant technical or natural sciences;
   - at least five (5) years of experience in environmental safeguards, environmental assessments, and similar.

v. **Coordinator for Health and Safety at Work** shall have:
   - university degree in relevant field such as architecture, engineering, construction management, or a related field;
   - certificate of completed expert exam for the coordinator for health and safety at work;
   - at least five (5) years of professional experience in construction.

vi. **Administrator** shall have:
   - university degree in civil engineering, construction management, business administration or a related field;
   - at least five (5) years of professional experience in the construction administration;
   - proficiency in Microsoft Office and project management software.

Team Leader will be responsible for the integrity and coordination with the Client, as well as leading and being responsible for the performance of all joint venture members (if applicable), sub-consultants and experts under this ToR.

In addition to the minimal required project staff defined above, the Consultant shall assess and provide other sufficient supporting staff.

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

Input documents provided by the Client is Main Design for hospital building, garage and access road (**ANNEX 1**), Bidding document for procurement of works (**ANNEX 2**), Exchange Information Requirements (EIR) and draft Environmental and Social Management Plan (ESMP) (**ANNEX 4**).

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

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 implementation of contract activities. The Consultant shall submit all deliverables to the PIU 1.

The Client shall appoint Construction Project Manager. Construction Project management services shall be provided by independent consultant. Construction Project Manager shall be appointed by the Client by a particular determination letter.

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 – Main Design for hospital building, garage and access road

ANNEX 2 – Bidding document for procurement of works

ANNEX 3 – Exchange Information Requirements (EIR)

ANNEX 4 – Environmental and Social Management Plan (ESMP) – draft

ANNEX 3 – 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 28 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).

Approved post-appointment BEP will also serve as a procedures manual. Procedures Manual is a document which presents methodology of Engineer's work, containing form templates, elaborated procedures, reporting plan, quality control plan and any other obligation that arises during execution of works. When preparing the post-appointment BEP (including Procedures Manual), the Engineer shall comply with the obligations arising from this Terms of Reference and General and Special Conditions of the Works Contract.

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 way 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. Structure of CDE shall enable the collaboration and data exchange between all project stakeholders (e.g., Beneficiary, Client, Designer, Contractor, Works Supervision, and Construction Project Manager). 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.

CDE will be established by the Client (i.e., Construction Project Manager service provider – ToR chapter VIII.) and shall 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. All project stakeholders and supply chain organisations are required to use CDE and defined procedures for data sharing through the CDE shall be included in post-appointment BEP.

Licenses and BIM training for all stakeholders will be provided by the Client and this is not part of this consultancy services.

2.4. Security

Data security protocol will be established by the Client (i.e., Construction Project Manager) 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 will 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 will be in accordance with the ISO 19650 series of standards.

All project stakeholders and supply chain organisations are required to adopt the security requirements and agreed data security protocol shall be used during project implementation by all project stakeholders and shall be included in post-appointment BEP.

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. Information breakdown structure 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).

Information breakdown structure will be defined by the Client (i.e., Construction Project Manager). 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

In this project there is one key role for provision of supervision of works in the BIM environment namely BIM Expert. The BIM Expert shall take lead on the execution of all activities which are related to the BIM environment and shall be a point of reference for all BIM data and information management. It should be ensured that the BIM Expert shall work independently from the other respective project leaders. It is desirable that the named BIM Expert has an 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.

When defining BIM Personnel, it is required that Consultant specify roles, and responsibilities for all project staff, including Key Experts and BIM personnel (BIM Expert). All Key Experts, BIM Expert, 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 Expert in the Expression of Interest or in the Technical Proposal, but it is mandatory that he/she is 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. All processes must follow ISO 19650 standard series, utilising the information exchange through the CDE.

The Consultant's collaboration process shall be presented in the pre-appointment BEP and shall be sufficient to demonstrate Consultant's competence and capability. The pre-appointment BEP response should include as a minimum detail of:

- description of the roles and relationships of the Consultant's personnel involved in the project (recommended using flow diagrams);
- frequency and formats of information exchanges;
- dependence of deliveries of other project participants on the Consultant's collaboration process.

The project collaboration process and data sharing through the CDE will be defined by the Client (i.e., Construction Project Manager). Consultant's collaboration process shall be adapted to the project collaboration process and requirements from the FIDIC Contract. Changes and alignment shall be implemented in the post-appointment BEP. Furthermore, when preparing the post-appointment BEP, Procedures Manual shall be included in the document as an annex.

2.8. Coordination process

Project quality and de-risking through model and information coordination 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. 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 shall define the time and content of the required information exchanges between the Consultant 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 the 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.

Monthly and Specific Reports shall be also in line with the requirements related to the BIM implementation on this project. Reports shall also include review reports on the Contractor's Documents and other deliverables (e.g., 4D and 5D BIM model, As-Built model, Contractor's BEP, etc.) which shall be in line with the BIM requirements defined for this project.

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.

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.