A.3.2.1 BUILDING EXECUTION PLAN (BEP)

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Prepared by:	BEN ISPC - CNR
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Index

1. INTRODUCTION

1.1. Document purpose

This document provides a framework Building Execution Plan (BEP) for the development of a virtual model, using the Heritage Building Information Modelling (HBIM) process, of the case studies selected within the ENI CBC Med project BEEP (BIM for Energy Efficiency in the Public sector) described in § 1.3.

Within this framework, each partner, together with appointed HBIM consultants (if present), should develop a specific BEP adapted to the characteristics of each case study, following the Exchange Information Requirement (EIR) already prepared of activity 1.3.2 of BEEP project. The EIR, in fact, act as a guideline for BEP implementation, both for BIM consultancy, in the case of a BIM tender (when it also represents the technical specification of the tender), and for partners' staff, in the case of in-house BIM modelling.

In line with the definition of ISO 19650, the BEP (intended in the regulation as BIM Execution Plan), defines the methodologies, requirements and timeframe on which the information modelling will be carried out. A BEP should detail not only how information is created and delivered, but also the 'why' (defining the BIM use), and the 'who' (assigning responsibility for it). It specifies the management, technical, commercial and project information and deliverables required for the project in a way that is specific, measurable, achievable and realistic. All parties must adhere to and follow the BEP.

1.2. General Project Information

This framework BEP concerns the development of a HBIM model of , of the case studies selected within the ENI CBC MED project BEEP (BIM for Energy Efficiency in the Public sector). The BEEP project aims to enhance the capacity of public local administrations to design, and realise innovative energy rehabilitation interventions on historic public buildings, by the mean of a multidisciplinary and integrated ICT tool (BIM and performance-based design: the Energy Efficient Heritage BIM approach – EE-HBIM). The testing of this emerging technology on built heritage will be performed to demonstrate its scalability to the entire building stock. The project will provide public administrations with a powerful method for the energy rehabilitation of public buildings to be supported with private funds through the Energy Performance Contracting.

Each partner will be responsible for enabling, creating and/or delivering a HBIM model of its case study in two different stages, corresponding to specific WPs of the BEEP project.

In Stage 1 (identified as WP3 A3.3.2), the required HBIM model will integrate previously collected information on the building that will be further provided to the Consultant (geometric, diagnostic, energy and environmental data), to create a comprehensive documentation of the building's current state.

Within WP4 A4.2.1., the HBIM model of the first stage will be used as a basis to inform a subsequent energy-environmental improvement concept, through energy renovation scenarios that are both compatible with the identified historic buildings and capable of enhancing their energy and environmental performance. Scenarios' energy performance will be evaluated with specific energy software, selected for each partner by WP3 and WP4 expert panels.

In Stage 2 (identified as WP4 A4.2.2), the technical characteristics of each scenarios and its energy performance will be integrated within the HBIM model (4D - 5D – 6D – 7D), in order to facilitate a ROI analysis and the drafting of EPC.

1.3. Glossary

Unless the context otherwise requires, the following words and phrases shall have the following meanings:

Building information modelling (BIM) - Use of a shared digital representation of a built **asset** to facilitate design, construction and operation processes to form a reliable basis for decisions. Digital representation of physical and functional characteristics of a facility creating a shared knowledge resource for information about it, forming a reliable basis for decisions during its life cycle, from earliest conception to demolition.

BIM Execution Plan (BEP) - Plan prepared by the Consultants that explains how the information management aspects of the appointment will be carried out, in response to the EIR. A BIM Execution Plan (BEP) defines how, why, when and by whom the information modelling aspects of the contract will be carried out. The use of BIM should be clearly agreed with the Employer and specified in the contract.

Pre-contract BEP - The pre-contract BEP is to demonstrate the Consultant's proposed approach, capability, capacity and competence to meet the EIR. It is utilised prior to the appointment of any Consultant.

Post-contract BEP - The post-contract BEP is the document defining standard methods and procedures adopted during the contract in order to meet the objectives and requirements set forth in the EIR. It is utilised following the appointment of project Consultant.

1.4. BIM Element Matrix (AIA)

BIM Element Matrix is a key document as it both allocates responsibility for preparation of the Models and identifies the Level of Detail and the properties by Uniformat/OmniClass classification for model elements.

Common Data Environment (CDE) - Agreed source of information for any given project or asset, for collecting, managing and disseminating each information container through a managed process. It is a means of providing a collaborative environment for sharing and coordinating work as information can be transferred through information exchanges and managed through the CDE. Strict operating procedures ensure a consistent approach by all organisations involved.

EIR Exchange Information Requirement - Tender document setting out the information to be delivered, and the standards and processes to be adopted by the Consultant as part of the project delivery process.

Industry Foundation Classes (IFC) - The IFC format is an industry-wide open and neutral data format that is fast becoming the de facto standard for rich data exchange. Further information can be found on the buildingSMART website https://www.buildingsmart.org/. The "native format" refers to the original software used for production of models.

Model federation - Creation of a composite information model from separate models. An assembly of distinct models to create a single, complete building information model of an asset.

OmniClass - The OmniClass Construction Classification System, also known as OmniClass™ or OCCS, is a classification system used for the organising and retrieving of information for the construction industry. For more information, see https://www.csiresources.org/standards/omniclass

Level of Information Need - The level of information need defines the level of maturity required for a particular information deliverable at a particular plan of work stage. It provides a framework that defines the extent and granularity of information and helps to prevent the delivery of too much information.

Model - Digital representation of part of the physical and/or functional characteristics of the Project.

Project - means the project to which the EIR relates.

2. MANAGEMENT REQUIREMENTS

2.1. Roles and responsibilities

Each specific BEP for each case study shall indicate the Project Team Members carrying the following roles, indicating their capability and experience to fulfil the requirements of the roles. The same person can fulfil different roles:

Function	Role	Name	Title
Management of the information process	BIM Manager		
Management of the CDE	CDE manager		
Management of the asset	BIM Coordinator		
Information modelling	BIM Specialist		

2.2. Model uses

The purpose of this section is to define the model uses of the HBIM model to be developed, as listed below:

Phase	**Objectives**	**Uses**
Stage 1 (WP3 A3.3.2)	Constructive HBIM model definition	Integration and representation of building geometrical and technical information according to the documentation provided by

		the Employer (geometric survey, drawings, etc.) Definition of building elements Space, areas and volumes analysis
	Management of the knowledge documentation on the historical building	Integration of historical documentation provided by the Employer (information sheets, links, etc.) Integration of diagnostic information provided by the Employer (materials and structure survey, etc.)
	Management of the environmental-energy analysis	Integration of energy and environmental analyses developed by the Employer.
Stage 2 (WP4) A4.2.2	Support of three energy intervention scenarios and of choice of adapted renovation strategies and technologies	Integration of three energy improvement intervention scenarios (short/medium/long term) provided by the design activity of the Employer with data concerning Time, Costs and management (4D, 5D, 6D, 7D)
	Assessment of ROI of the environmental-energy intervention scenarios	Integration of Return of Investment evaluation method based on the intervention costs and energy saves of the interventions

2.3. Level of Information Need

The level of information need defines the level of maturity required for a particular information deliverable at a particular plan of work stage. It provides a framework that defines the extent and granularity of information and helps to prevent the delivery of too much information.

The level of information needs for this project will be defined using the BIM Element Matrix, which is a key document as it both allocates responsibility for preparation of the Models and identifies the Level of Detail and the properties by Uniformat/OmniClass classification for model elements.

2.4. Model federation and data segregation

Each specific BEP for each case study shall indicate a federated model strategy, depending on the case study dimension and on the energy simulation process. It is recommended to separate at least: Architectural model; MEP model including terminals and heating and cooling production system– useful for the energy analysis. A separated structural model is more useful with a frame concrete or wood structure.

For Stage 2 (WP4), a model federation strategy will be further developed to better represent the three energy improvement intervention scenarios.

2.5. Data sharing and collaboration

The Consortium as a whole and each team working on the same case study will establish an agreed protocol for coordinating and sharing models, including how they will be controlled for quality and for ensuring security of information. Information may flow both ways.

The Consortium will provide a Common Data Environment (CDE) complying with ISO 19650 and ISO 27001, to be used by partners and their employees and consultants for the management or sharing of data. This must facilitate collaboration and information sharing between members of the project team. It is essential that common BIM standards covering detailed processes within each organisation are established and agreed in advance.

2.6. Naming convention

For the file naming convention, the Consortium will provide a naming specification, to be used for all document types uploaded to a CDE, in line with IEC 82045-1 and BS 1192:2007(A2) 2016. For the object naming convention, Omniclass standard will be applied, as will be developed in the BIM Element Matrix (see § 2.3.1). If necessary on a given case study, the naming convention can be integrated for specific not supported elements, following the same naming methodology.

2.7. Modelling strategy

The modelling process will be based on the BIM Element Matrix.

The modelling process will be based on the geometric and technical information (geometric survey, drawings, etc.) collected during activities A3.2.1 and A3.2.4. Based on the provided information, the model will represent the constructive system and technological characteristics of the building (vertical and horizontal structural system, materials, etc.) and as accurately as possible within the Level of Information Need. The walls, roofs and floors will be modelled with their stratigraphy (know or assumed). Decorative elements can have a simplified representation, as long as their constructive system is detailed.

The HBIM model development will take advantage of the parametric tools of native software (e. g. system families) as much as possible, avoiding non-parametric tools such as mass modelling. The correct representation of the building technical, constructive and environmental features is paramount, even when leading to simplification of uneven features, typical of historical buildings. Each team working on the same case study shall develop a simplification strategy (e.g. assuming planarity of walls), if needed.

Historical and diagnostic information (materials and structure survey, energy analyses, etc.) collected during activities A3.2.2 and A3.2.5 will be incorporated in the model. If the information cannot be directly integrated in the elements, it can be linked using reports, sheets, drawings, etc.

In order to support environmental-energy intervention scenarios, the energy information collected in activity A3.2.6 (e.g. transmittance values for walls and windows, occupancy data, etc.) will be integrated in the model. Occupancy and uses profiles for

each room and/or thermal zones, if not included in the model, will be linked as external files (reports, sheets, etc.).

Regarding MEP system, HVAC systems terminals and plants will be represented. If no specific MEP system is modelled, the room information must include data on plants and terminals.

Regarding object insertion and constraints, all objects (walls, roofs, ceilings, floors, HVAC systems, structures, windows, etc.) must be constrained to the corresponding lower and upper level.