REGIONE TOSCANA

TEMPLATE PROJECTS PARTNERS SEARCH

Organisation	**Name of the organisation**	University of Florence
	Description of the organisation	
Project	**Name of the project (call identifier)**	SIBEST - Smart industrial Building: from Industrial Building ExiSting to Technological one (CALL: Building and renovating in an energy and resource efficient way - TOPIC ID: LC-GD-4-1-2020) and other
	Topic	Prefabricated building, energy redevelopment, energy storage, seismic retrofitting, environmental monitoring, smart building
	Description of the project	The research aims at creating a competitive supply chain able of designing and implementing systems for technological, seismic and energy redevelopment of the existing industrial building stock with particular reference to the one that is characterised by asbestos roofs that need to be replaced as a matter of urgency. These systems will be part of a process that involves several redevelopment actions and different systems and components that will have to be used, some of which are currently not available on the market. The process and the related technical-operational protocol that is to be implemented, and which will be developed using innovative methods, briefly involves the following sequence: 1) removal and disposal of asbestos roofing systems, typically asbestos roof tiles placed above the roof beams of the building; 2) replacement of roofing systems with innovative low-carbon high insulation elements, which on the top surface will have photovoltaic panels that will be designed and prototyped during the research; 3) interventions for the improvement and seismic retrofitting of the building, with innovative systems some of which will be designed and prototyped during the research; 4) implementation of a medium-term storage system for energy produced by renewables, this system also will be designed and prototyped during the research; 5) integration in the building of control and

		monitoring systems for structural, environmental and energy diagnosis, systems that will be integrated and developed during the research also through a prototype stage. The project develops on the assumption that in Europe during the '70s and '90s an extensive industrial building stock was built, which in many cases is now dilapidated and it really needs energy and structural redevelopment. It is necessary to underline that in the context of nearly zero energy, low-carbon and smart building redevelopment, the intervention strategies must include an integrated design approach and refer to the interaction of aspects related to different disciplinary areas concerning the construction. Thus taking into account architectural, structural, energy and system engineering issues according to the needs of the production process, pursuing efficiency also on an economic level. Therefore, the project partners, each one with their own skills and know-how, want to promote integrated retrofitting actions aimed at making the existing industrial building stock safer and more energy efficient, in order to develop and subsequently market some of the innovative components of the redevelopment process.
	Project manager	Prof. Frida Bazzocchi
	Aim of the project	The research aims at developing procedural tools and define new technical solutions available for retrofitting existing industrial buildings. Starting from the definition of existing industrial building typologies, a stage to which the working group has been applying for some time now, the research intends to identify the most recurrent ones in order to clearly define the feasible approach to involve the largest share of the market. Starting from the assumption that the configuration of the existing industrial building is certainly characterised by problems related to the asbestos in the roof and the consequent need for replacement, in addition to the inadequate seismic performance and energy inefficiency, we intent to develop lines of action that take into account the various technical issues (technological, energy, environmental, safety and systems) and economic ones (cost of the intervention, building maintenance, reduction of management costs) in a "carbon free" logic that aims at the efficiency of the construction, introducing in the redevelopment new systems and technical elements of which prototypes will be made during the research.

		For this purpose, an existing industrial building will be used as a case study. The prototypes of the different systems and components, that will be realized during the research, will be installed and tested on it, specifically: - two different types of low-carbon roofing systems, one with a mainly metal structure, and the other one with a wooden structure, which will integrate the photovoltaic system that will power the prototype energy storage system; - innovative anti-seismic devices to be placed on the main components of the prefabricated reinforced concrete frames, and in the interface with the roofing systems; - an energy supply system integrated with the building it operates, i.e. a system for the production of electrical and thermal energy by fuel-cell powered by hydrogen, produced on site by an electrolyser that uses the electricity generated by the photovoltaic system. The electrical energy will be stored in the form of hydrogen. The photovoltaic system with hydrogen storage that is to be tested consists of: photovoltaic panels as energy source, an electrolyser, a hydrogen storage tank, a fuel cell, a small battery pack, appropriate electronic power converters, a heat recovery system generated by the fuel-cell for possible use with domestic hot water/heating and cooling, a monitoring system for the acquisition of the operating parameters of the whole system and its components; - an innovative monitoring system capable of acquiring and managing not only energy parameters but the building's structural ones as well. It will be functional to the definition of a building model powered by energy produced from renewable sources (through the photovoltaic system integrated in the roof), able to storage energy and in which the energy issues are integrated with the structural ones. The project will therefore focus on some lines of action and related aims: - identification of the most recurrent buildings and prevalent problems, with particular reference to the most inefficient elements (e.g. the roofing system); - development of a protocol for the disposal of asbestos elements that are very often present in existing roofs and subsequent replacement with innovative roofing systems; - identification of procedures for structural diagnosis aimed at defining the state of conservation of the elements and materials of existing buildings; - identification of procedures for the energy and environmental diagnosis of the building aimed not

		only at defining the building's energy identity card, but also at assessing all the potential effects of recovery and optimisation of energy flows. Indeed, it must be considered that the industrial buildings within the urban context, unlike other civil buildings, are favourably predisposed to have energy recovery and production systems from renewable sources. They can thus be transformed from buildings with high energy consumption and environmental impact to highly incisive production units in the creation of "carbon free" urban contexts; - construction and installation on the sample building of two different "low carbon" roofing systems integrated with devices for the production of energy from renewable sources (photovoltaic panels) and with high safety performance both static and seismic, as well as design; - construction and installation of innovative products and elements for the seismic improvement of construction that are also economically sustainable; - design and construction in the sample building of an energy storage system for the energy produced from the building through the use of renewables; - design and implementation in the sample building of a sensor system and monitoring one for structural diagnosis, building performance related to seismic actions, energy and environmental diagnosis and evaluation of all potential effects of recovery measures and energy flows optimisation.
Partner	**Specific requirements for partners (location,..)**	Specify the skills: Hydrogen Photovoltaic Building Monitoring
	Type of partner required	Research Centres and Institutions and Companies
Additional info	**Preliminary budget (sources of funding,..)**	1.5 M€
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