PARTICULAR TECHNICAL SPECIFICATIONS CLAUSES TO BE FOLLOWED IN THE OPEN TENDER PROCEDURE FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF TWO TEST AREAS, ONE FOR ON-BOARD HYDROGEN FUEL CELL STACKS (AREA A3) AND OTHER FOR ON-BOARD HYDROGEN FUEL CELL SYSTEMS (AREA A4) FOR THE AUTOMOTIVE AND HEAVY TRANSPORT SECTORS (BUSES AND TRUCKS) UNDER INTERNATIONAL STANDARDS

1. BACKGROUND

Gipuzkoa Provincial Council, through the Strategy of the New Mobility, aims to encourage and boost the development towards a new kind of mobility. Its mission is to integrate the interests of all the agents in the surrounding area, that can be exported and help to make Gipuzkoa and Euskadi a region of international benchmark in the field of new smart sustainable mobility. To do this, however, it is vital to have a catalyst with these capabilities and capacities, and for this purpose, Gipuzkoa Provincial Council created the foundation named MUBIL Fundazioa.

To be able to achieve these challenges and aims the MUBIL Fundazioa is developing a strategic project that positions and consolidates the industrial sector by aligning public and private aims and efforts with international projection: “MUBIL: Reference Hub in Smart and Sustainable Mobility”.

The MUBIL Hub aims to consolidate a space/eco-system for interaction and integration of knowledge and skills, involving the entire mobility value chain, meeting the needs of public authorities, businesses, technology centres, academia and citizens. Furthermore, MUBIL aims to boost and encourage the development of more sustainable mobility; helping to meet the goals set by the European Union for 2050 (the EU hopes to be climate neutral by that year, that is, an economy with net zero emissions of greenhouse gases).

The goals that the MUBIL Hub aims to achieve are as follows:

- Generating a new business network linked to electric, connected, shared and autonomous mobility, and therefore transforming the existing one.
- Generating new business models (start-ups), entrepreneurship and quality jobs.
- Strengthening capacities for R+D and knowledge creation in new technologies like energy storage, electric traction, power electronics, hydrogen, rare earth elements, etc.
- Attracting new companies and retaining investment for sustainable growth and retain talent people.

Nowadays, the MUBIL Hub is actively supporting the industrial network; in 2021, the provisional facilities were opened in Usabal (Tolosa, Gipuzkoa) which have, among other services, an energy storage laboratory.

In 2023, MUBIL Fundazioa will move to its definitive facilities in Eskuzaitzeta (San Sebastian, Gipuzkoa), where all the services will be consolidated, including the launch of the technology laboratory (moving the current laboratory and rolling out the other laboratories together with their corresponding equipment).

As a result, MUBIL Fundazioa aims a further step to set up a technology infrastructure that meets the R+D and Applications needs of companies. The laboratories should cover the testing for characterization, validation of products & processes developments and applications programmes of electric traction systems (area A1 and A2, not included in this document) and on-board hydrogen fuel cell systems (area A3 and A4) for the automotive and heavy-duty transport sectors (buses and trucks) under international standards.

2. PURPOSE OF THE CONTRACT

The purpose of the contract to which this tender relates is to supply, install and commission state-of-the-art and flexible **turnkey solutions** of two test areas for testing and characterising Hydrogen Polymer Electrolyte Membrane (PEM) fuel cell full stacks (area A3) and fuel cell systems (area A4) for automotive and heavy transport sectors (buses and trucks) **under international standards** and in accordance with the provisions of the specifications presented in the particular administrative clauses and in these particular technical specifications clauses. Furthermore, accomplishing the Safety European standards.

The hydrogen laboratory will consist of two testing areas:

- Test Area 3 (A3): with testing capabilities of power up to 200kW and controlled climatic conditions for fuel cell full stacks.
- Test Area 4 (A4): with testing capabilities of power up to 250kW and controlled climatic conditions for fuel cell systems.

In addition, the contract will include (without any additional cost):

- Installation, commissioning and calibration of all equipment.
- Detailed description and schematics of the equipment and installation.
- Detailed description of the tests and set-ups of the testing areas.
- Detailed description of the installation requirements and fitting out of the site.
- Training of the laboratory staff on how to operate the test benches.
- Documentation of all equipment, installation, training, etc.
- List of identified laboratory risks and mitigation strategies.
- Detailed description of the maintenance of all equipment.
- Spare parts recommendation.
- Two-years warranty.
- **CE marking for the complete solution, not just for the equipment.**
- After sales services.

The CPV code for the contract is the following:

385400000-2 Measuring machines and devices.
38970000-5 Research, tests and scientific-technical simulators.
713000000-1 Engineering services.
51000000-9 Installation services.

3. TECHNICAL REQUIREMENTS

Test benches or test areas to be supplied, installed and commissioned in this tender will consist of two areas as described in PURPOSE OF THE CONTRACT.

Between both areas, PEM fuel cell full stacks and systems will be tested. Functional or performance tests, endurance, durability or and degradation tests will be able to carry out with controlled climatic conditions.

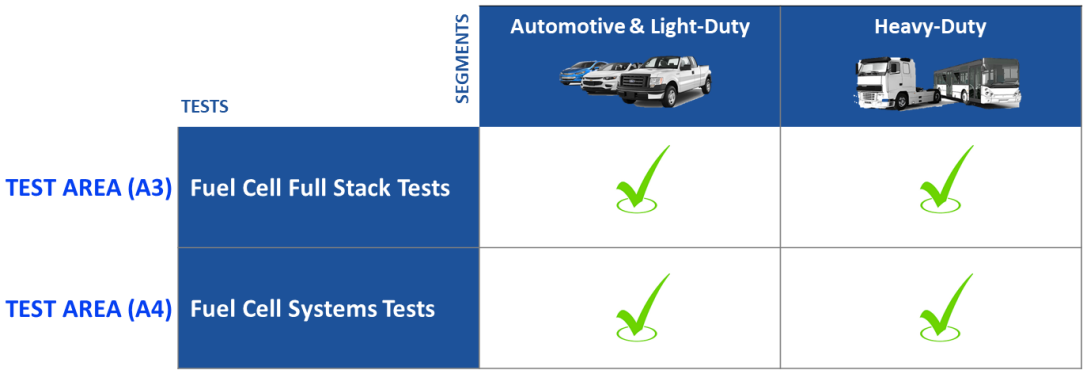


Fig. 1. MUBIL hydrogen laboratory testing capabilities.

In the tables below, the equipment required in each area to carry out the aforementioned tests are presented.

The tables are structured as follows:

- First column: quantity of units required by equipment.
- Second column: the most significant technical characteristics of each equipment.
- Third column: minimum requirements that technical characteristics of each equipment must meet.

Note that all equipment must meet all minimum requirements.

If any of the technical specifications included in these specifications determine a specific model, brand or standardisation, they must be interpreted as minimum requirements to be met, without implying exclusivity of a manufacturer or distributor.

All the technical specifications reflected below are understood to be included in the offered price, without it being possible to reflect price increases for specific modules or functionalities.

Likewise, in the equipment proposed and therefore in the price offered, all those components, devices, modules, interconnection elements and accessories necessary for the set-up and

operation of the equipment will be understood to be included. Likewise, the software licenses will be understood to be included in the equipment and in the price offered.

Finally, all equipment offered must be equipment already validated in real applications (equipment developed especially for this project will not be accepted).

3.1. Minimum requirements of equipment of test area 3 (A3)

Here below, the equipment and their requirements that comprise this testing area are presented. **Note that all equipment are required:**

Qty.	Technical characteristics	Minimum requirements
1	**Test station**	
	DUT	PEM fuel cell full stack
	Max. power of the PEM fuel cell stack	200kW
1	**DUT handling trolley or similar**	
	Max. DUT weight	300kg
1	**Gas flow control system**	
	Anode flow control range	up to 3600 Nl/min
	Cathode flow control range	up to 10000 Nl/min
	Nitrogen Emergency Purge on Anode and Cathode	Required
	Mass Flow Controller accuracy	±0.5% of reading
1	**Automated stack bypass**	
	Bypass valves at DUT inlets and outlets (anode and cathode)	Required
1	**Humidification system for anode & cathode**	
	Dew-point control range	up to 90°C dew point
	Dew-point control accuracy	±1 °C steady state, ±2 °C dynamic
	Gas temperature range	- 30°C to 95 °C
	Gas temperature control accuracy	±1 °C steady state, ±2 °C dynamic
	Temperature sensor accuracy	±0.5°C
	Dry gas by-pass	Required
	Included dynamic dew point variation	Required
	Reactant gas flow, t90	t90 up to 1 s
	Dew point temperature – standard contact humidification	1.3 – 2.5°C/min
	Dew point temperature – rapid response humidification	within 5-10 seconds @mixing point
	Inlet gas (reheat) temperature	1.5 to 4°C/min (depending on flow)
1	**Pressure control system (inlet & outlet, anode & cathode)**	
	Pressure control range	0-5bar

	Control stability	±0.03bar (±3kPa) for 0-5 bar
	Measurement points in outlets and inlets	1x Inlet & Outlet (Anode & Cathode)
	Control points in outlets and inlets	Required
	Measurement range	0 to 5 bara
	Measurement accuracy	±0.25 % FS
	Dead end/purge control and regulation	Required
1	**Exhaust system**	
	ATEX design for cathode for hydrogen concentration >4%	Required
	Heat exchanger	Required
	Condensate trap	Required
1	**Hydrogen concentration measurement system**	
	Measurement point cathode outlet	Required
	Measurement range	0.5 to 10 Vol% H_2
	Response time sensor	< 3s
1	**Test item pressure and temperature measurement**	
	Measurement point temperature (inlet and outlet)	Required
	Measurement point pressure (inlet and outlet)	Required
1	**Electronic load bank**	
	Channels	≥ 1
	Operation modes:	Constant current, constant voltage, constant power, constant resistance.
	Max. output current	±1000A
	Max. output voltage	800V
	Maximum continuous power	200kW
	Interface	CAN, Ethernet…
	Test item interface	Required
	DC connection cable	Required
	Safety control	Required
	Insulation monitoring	Required
	Load disconnect	Required
	Reverse polarity protection	Required
1	**Cell voltage monitor (CVM)**	
	Number of cells	350
	Voltage range	-1 V to +5 V
	Resolution	16Bit
	Accuracy	±0.1 %
	Sampling rate	100 ms
	Auxiliary interfaces	
	TC, K-type	≥ 32
	Analog input, 0 to 10 V	≥ 10
	Analog input, 4 to 20 mA	≥ 10
	Analog output, 0 to 10 V	≥ 10
	Analog output, 4 to 20 mA	≥ 10
	Digital input, 24 V	≥ 16

	Digital output, 24 V	≥ 16
	Temperature limiter	Required
	Input: Pt100, 4-wire	≥ 16
	RS 232	≥ 1
	RS 485	≥ 1
	Power supply 230Vac (max. 10A)	≥ 1
	Power supply 24Vdc (max. 10A)	≥ 1
	Additional power plugs	≥ 4
1	**Stack cooling system**	
	Inlet pressure, outlet pressure or differential pressure control	Required
	Inlet temperature control	Required
	Flowmeter for water flow control	Required
	Measurement: - Inlet & outlet pressure - Inlet & outlet temperature	Required
	Heating capacity	12 kW
	Cooling capacity	250 kW
	System pressure control range	1 to 4 bara
	Pressure sensor accuracy	±0.25 % FS
	Coolant flow	Up to 320l/min
	Flow measurement accuracy	±1% of reading
	Maximum temperature	Up to 90°C
	Temperature control accuracy	±1°C (steady state)
	Temperature sensor accuracy	±0.5°C
	Conductivity sensor and automatic conductivity control for deionized water operation	Required
	Conductivity sensor	0 to 20 µS
	Conductivity control method	replenishment
1	**Climatic chamber**	
	Approx. test cabin useful size (inside)	≥ 1.5 m x 1.5 m x 1 m [LxWxH], ~2m^3
	<u>Temperature control range</u>	
	Temperature range	-40° to 120°C
	Temperature accuracy	±1°C
	Stability of temperature	±1°C
	Cooling speed	4.5K/min
	Heating speed	4.5K/min
	Heat compensation	40kW @ -20°C
	<u>Humidity control range</u>	
	Humidity range	15 to 98 % RH (10°C to 90°C)
	Humidity accuracy	±2 % RH
	Humidity stability	±5 % RH
	Safety level (details): - Safety electromagnetic door locking - Independent over-temperature limiter Tmax - Venting duct with reversible flap - Flushing device for chamber inertisation	Required

	- ATEX - Hydrogen concentration measurement	
	6 x entry port Ø50mm for electrical connections	Required
	Door with window	Required
	Ethernet interface	Required
	Chamber in compact design with closed machine compartment	Required
	Reinforced base to support more than 350kg	Required
1	**Extended heated lines if required to operate with climatic chamber**	
	Extend anode/cathode/coolant supply and return lines from the test station in A3 to the climatic chamber	Required
	Stainless steel tube and hoses with thermocouples, insulation and fittings are required. Additional electric heat trace on inlet lines must be also included.	
	The bidder must guarantee that the length of the tubes is sufficient to make the connections safely, but without affecting the performance of the test station.	Required
1	**Automation and control software**	
	Include automation and control system that allows you to create and execute automated test procedures using design of experiments methods and determine the optimal parameters for the control units based on models and optimizations.	Required
1	**Calibration system**	
	Include calibration system that allows you to characterise and optimise the control system in most efficient way possible.	Required
1	**Data processing software**	
	Include data processing platform for visualizing, analysing and reporting measured and simulated data types and creation of formula, scripts and macro developments.	Required

3.2. Minimum requirements of equipment of test area 4 (A4)

Here below, the equipment and their requirements that comprise this testing area are presented. **Note that all equipment are required:**

Qty.	Technical characteristics	Minimum requirements
1	**Test station**	
	DUT	PEM fuel cell systems
	Max. power system	250kW (200kW PEM fuel cell + 50kW battery)
1	**DUT handling trolley or similar**	
	Max. DUT weight	500kg
1	**Gas flow control system**	

	Anode flow conditioning	
	Anode flow (control range)	up to 3600 Nl/min
	Coriolis mass flow meter for high accuracy	up to ±0.5% actual value
	Anode nitrogen (control range)	purge with approx. 100 Nl/min
	Pressure control	Required
	Pressure range	Up to 25bar
	Pressure stability	±0.5bar
	Pressure sensor accuracy	0.5% FS
	Cathode air flow conditioning	
	Air consumption measurement unit	Required
	Connection of measurement section	Required
	Cathode air flow	up to 10000 Nl/min
	Mass flow meter for high accuracy	up to ±1% actual value
	Gas temperature control accuracy	±1 °C
	Humidification	Required
	Dew-point control range	up to 90 °C
	Dew-point control accuracy	±1 °C (steady state, ±2 °C Dynamic)
	Dry gas by-pass	Required
	Humidity sensor	Required
1	**Exhaust system**	
	Function to prevent combustible hydrogen gas from entering drain lines and thus the carryover of ATEX zones	Required
	ATEX design exhaust path	Required
	Passive suction	Facility exhaust path provides underpressure
	Blower exhaust	Active suction of exhaust gases by ATEX ventilator in exhaust path
	Heat exchanger	Required
	Condensate trap	Required
1	**Hydrogen concentration measurement system**	
	Measurement point cathode outlet	Required
	Measurement range	0.5 to 10 Vol% H_2
	Response time sensor	< 3s
	Accessories	Separate flow parallel to exhaust gas flow
1	**Test item pressure and temperature measurement**	
	Measurement point temperature (inlet and outlet)	Required
	Measurement point pressure (inlet and outlet)	Required
1	**Electronic load bank**	
	Channels	≥ 1
	Operation modes:	Constant current, constant voltage, constant power. - Drive test: extended constant voltage (constant

		voltage source with switchable capacitor for improved voltage stability) - Constant resistance
	Max. output current	±1000A
	Output voltage range	100-1200V
	Maximum continuous power	250kW
	Interface	CAN, Ethernet…
	Test item interface	Required
	DC connection cable	Required
	Safety control	Required
	insulation monitoring	Required
	Load disconnect	Required
	Reverse polarity protection	Required
1	**High voltage source for startup**	
	Channels	≥ 1
	Operation modes:	Constant current, constant voltage, constant power.
	Output voltage	1000V
	Maximum continuous power	60kW
	DC connection cables	Required
1	**Battery simulator**	
	Nominal power	250kW
	Maximum output voltage	≥ 1200Vdc
	Minimum output voltage	≤ 50Vdc
	Output current @ 600Vdc	±400Adc
	Cables, accessories, configuration, etc. needed to connect the unit	Required
	EMC compliance according to 2014/30/EU electromagnetic compatibility	Required
	Battery model included and fully integrated in the test automation System	Required
	Operation mode as battery tester and battery emulator / simulator Considering also a power distribution unit or another hardware if is needed for operation	Required
1	**Low voltage power supply**	
	1x 48V DC supply (max. power 1500W)	Required
	1x 24V DC supply (max. power 1500W)	Required
	1x 12V DC supply (max. power 400W)	Required
	1x 5V DC supply (max. power 200W)	Required
	Control	Required
1	**Power analyser**	
	Data acquisition measurement system (channels) - Digital inputs - Digital outputs - Analog inputs - Analog outputs	Required

	- Frequency inputs - Frequency outputs	
	It should be able to measure pressure, temperature, relative humidity, ambient conditions and voltage	Required
	Temperature sensors: with the capacity to measure up to 300°C	Required
	Characteristics of the relative humidity measurement system: - Measurement range: 0 – 100% RH - Accuracy: ±1% RH in the range of 0 – 90% RH - Temperature measurement range: -40 – 80ºC - Ability to measure environmental conditions	Required
	Characteristics of the pressure measurement system: - Pressure sensors must be compatible with H_2 when necessary - They must provide measurements at least in air circuit inlet, fuel cell system outlet, compressor inlet and outlet, anode and cathode - The signals from the pressure transducers must be compatible with the control platform that must be able to monitor them - The system must incorporate safety mechanisms and complete mechanical compatibility with the rest of the equipment	Required
	The system must include all the necessary hardware for its correct operation and use by an operator, as well as the necessary interconnections between the different elements and their integration in the control and automation platform	Required
1	**HV measurement**	
	DC Voltage	0 - 1200 V
	DC Current	0 - 1000 A
1	**Cell voltage monitor (CVM)**	
	Number of cells	400
	Voltage range	-1 V to +5 V
	Resolution	16Bit
	Accuracy	±0.1 %
	Sampling rate	100 ms
1	**Auxiliary interfaces**	
	TC, K-type	≥ 32
	Analog Input, 0 to 10 V	≥ 10
	Analog Input, 4 to 20 mA	≥ 10
	Analog Output, 0 to 10 V	≥ 10
	Analog Output, 4 to 20 mA	≥ 10
	Digital Input, 24 V	≥ 16
	Digital Output, 24 V	≥ 16
	Temperature limiter	Required
	Input: Pt100, 4-wire	≥ 16

	RS 232	≥ 1
	RS 485	≥ 1
	Power Supply 230Vac (max. 10A - combined)	≥ 1
	Power Supply 24Vdc (max. 10A - combined)	≥ 1
	Additional power plugs	Required
	TrueData-CAN	
	Vector Box VN89xx	Required
1	**System main cooling loop**	
	Control	Delta p, Delta T or Flow (0-100% FS of pump)
	Pump	Required
	Bypass pump	Required
	Measurement	Required
	Cooling capacity	280kW
	Heating capacity	24kW
	System pressure control range	0 - 4 bara
	Pressure measurement range	0 - 6 bara
	Pressure sensor accuracy	0,5% FS
	Max. pressure drop	0.6bar
	Maximum coolant flow	>360 l/min
	Flow measurement included	Required
	Maximum temperature	100°C
	Minimum temperature	40°C
	Temperature control accuracy	±1°C
	Temperature sensor accuracy	±0.2°C
	Conductivity sensor and automatic conductivity control for deionized water operation	Required
	Conductivity sensor	0 to 20 µS
	Conductivity control method	Replenishment
1	**System Second Coolant Loop**	
	Control	Delta p or delta T or flow
	Pump	Required
	Bypass Pump	Required
	Measurement	Required
	Cooling Capacity	20 kW
	Heating Capacity	9 kW
	System pressure control range	1 to 4 bara
	Pressure measurement range	0 to 6 bara
	Pressure Sensor accuracy	±0.5 % FS
	Maximum coolant flow	30 l/min
	Flow Measurement	Required
	Flow Measurement Accuracy	±1% actual value
	Temperature control range (outlet gas)	+10 °C to +140 °C
	Temperature control accuracy	≤ ±0.5 °C
	Temperature sensor accuracy	≤ ±0.1 °C
1	**Climatic chamber**	
	Approx. test cabin size (inside)	3 x 2.8 x 2.1 m [LxWxH], ~ 18m³

	Integration into test station	Required
	<u>Temperature control range</u>	
	Temperature range	-40° to 120°C
	Temperature accuracy	< ±0,5 K
	Temperature constant	< ±0,5 K
	Cooling speed	4.5 K/min
	Heating speed	4.5 K/min
	Heat compensation	11.4 kW @ -40°C; 40 kW @ -20°C
	<u>Humidity control range</u>	
	Humidity range	15 to 95 % RH (10°C to 90°C)
	Humidity accuracy	±2 % RH
	Humidity stability	±5 % RH
	Safety level: - Safety electromagnetic door locking - Independent over-temperature limiter Tmax - Venting duct with reversible flap - Fire detection with CO-sensor - N2-flushing device - ATEX - Hydrogen concentration measurement - Continuous O_2 monitoring - Purge air flap 150mm	Required
	6 x entry port Ø125mm for connections (cooling water, H_2, Air, cables,…)	Required
	Double-leaf door with window	Required
	Ethernet interface	Required
	Chamber in compact design with closed machine compartment	Required
	Max. permissible interior floor weight (distributed)	1500 kg
1	**WorkStation**	
	If the operating system and the real-time control system are on the same PC the capabilities of the equipment must be similar to the following: - CPU 1x8-Core Intel Xeon - USB 16xRS232 Adapter - LAN 2xOnboard Ethernet - RAM 32GB - SSD 2x512GB in RAID (=512GB Storage) - Graphic nVidia Quadro P620 (4 Outputs) - 5 x INtime PCI-E Slots (IEEE 1394, Ethernet RT, CAN,…) If they are separate, they must be sufficient to ensure smooth operation of both systems giving at least hardware performance for the combined systems.	Required
1	**Simulation software package**	

	A vehicle simulation software package to be used in combination with the test area 2 (A2) to reproduce driving dynamics of a fuel cell electric vehicle in a physically realistic way simulating vehicle, driver, road load and road gradient. In addition, it will simulate at least the following components that are part of the energy flow in the vehicle: - Hybrid Control Unit (HCU): to determine the requested power output and operating mode of the fuel cell and define the battery usage (power providing or recharging) based on the battery SOC and on the current vehicle power requirement. - Vehicle Control Unit (VCU): to define the torque demand to the simulated electric drive based on the driver request and on the available power in the system, including the consideration of the battery's state of charge (SOC). It also will handle the definition of the recuperation torque during braking.	Required
1	**Test areas connection software** Connection software to link different test areas and simulation systems with, at least, following features: - Central configurable - Energy flow control - Safety system for all test areas connected - Real time signal management for all systems - Data objects - Standardized data and signal interfaces of all systems	Required
1	**Automation and control software** Include automation and control system that allows you to create and execute automated test procedures using design of experiments methods and determine the optimal parameters for the control units based on models and optimizations.	Required
1	**Calibration system** Include calibration system that allows you to characterise and optimise the control system in most efficient way possible.	Required
1	**Data processing software** Include data processing platform for visualizing, analysing and reporting measured and simulated data types and creation of formula, scripts and macro developments.	Required

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4. LAYOUT

Each bidder will have to submit a proposal for the layout of the hydrogen laboratory with the following sections:

1. Test area A3 (with all equipment of this area)
2. Control room of test area A3
3. Test area A4 (with all equipment of this area)
4. Control room of test area A4

Distribution of the sections and the equipment will have to be based on ensuring the safety, for both equipment and personnel, and confidentiality. For this, the drawing of the space available to develop this laboratory is provided (see ANNEX I. DRAWING OF SPACE AVAILABLE FOR THE LABORATORY).

5. SAFETY REQUIREMENTS

The safety requirements each test area must comply with are presented here below:

- A safe work environment (a trouble-free and riskless state under operation of an inherently safe DUT) for all employees will have to be ensured in all test benches.
- Test areas must go through a risk and hazard evaluation before operation (one evaluation per area). These analyses will be delivered in conformity with the legal regulations.
- The safety systems will have to have an access system for authorised operation of the test areas.
- Safety-related shutdowns will have to be performed by means of hardware and software.
- Normal stop procedure will also have to be implemented for minor fault situations.
- Any supply (electricity, hydrogen,…) will have to be stopped automatically in the event of risk.
- Emergency button will have to be available to operators to be able to stop immediately all test benches functions.
- The complete test areas will have to be monitored by a safety related PLC system that will handle all reactions according to the dedicated safety matrix.
- The safety PLC system will have to control and monitor the safety interfaces of the equipment (gas detection systems, smoke detection systems, stop and emergency systems, temperature, etc.) and to reduce the risk of the test benches.
- Temperature of test areas will have to be controlled separately.
- Error and status messages will have to be notified to the staff, for example, visualising on a touch panel on the test area door.

6. BUILDING REQUIREMENTS

It will be the responsibility of the successful bidder to define the requirements of the building (electrical installation, civil works, compressed air supply, safety requirements,...) to guarantee the correct operation of all the equipment.

7. INSTALLATION

It will be the responsibility of the successful bidder to install and to double-check the installation of all equipment without causing damage to the equipment itself or to the building and without any additional cost.

The installation will be considered completed when the successful bidder delivers the factory acceptance tests results report to MUBIL Fundazioa, with all tests passed successfully (see section 10).

8. COMMISSIONING

It will be the responsibility of the successful bidder to commission and to double-check the commissioning of all equipment without causing damage to the equipment itself or to the building and without any additional cost.

The commissioning will be considered completed when the successful bidder delivers the factory acceptance tests results report to MUBIL Fundazioa, with all tests passed successfully (see section 10).

9. CALIBRATION

It will be the responsibility of the successful bidder to calibrate and to double-check the calibration of all equipment without causing damage to the equipment itself or to the building and without any additional cost.

The calibration will be considered completed when the successful bidder delivers the factory acceptance tests results report to MUBIL Fundazioa, with all tests passed successfully (see section 10).

10. FACTORY ACCEPTANCE TESTS

The factory acceptance tests (FAT) are a set of tests to ensure the correct installation, commissioning, calibration and operation of all equipment individually and all together. The successful bidder will perform these tests and report the results. In this way, the successful bidder will accept the responsibility of the fact that it has done the installation and

commissioning correctly and there is no error that can damage the equipment or the building installation or injure any staff.

The tests to be carried out will be shared and contrasted with the successful bidder during the execution of the project.

It will be the responsibility of the successful bidder to make the set-up of the test benches and DUTs, to program the automation and control system and the data acquisition systems and to carry out the FAT tests to validate the installation and the commissioning.

A test period of **3 weeks** is estimated to be necessary for the realisation of this FAT in the absence of faults.

It is the responsibility of the successful bidder to correct any error that may be identified during the factory acceptance tests without any additional cost. If there is any failed test, the successful bidder is the responsible for finding and correcting the error and repeating the test until it is passed.

Installation, commissioning and calibration will be considered completed, when the factory acceptance tests results report (with all tests passed) is delivered to MUBIL Fundazioa.

11. TRAINING

The successful bidder will provide the necessary in-situ training with qualified personnel of the company to guarantee that the staff of the laboratory will be able to use the acquired equipment without increasing the price.

Successful bidder will provide training for operators, with a minimum duration of **one complete week.**

Training subjects will be at least:

- General description of all equipment.
- Layout of all equipment and electrical schematic of both test areas.
- Design and functionalities of all equipment.
- Operation and handling of all equipment.
- Recognition of error situations, understanding error messages and correction of errors of all equipment.
- Description of the tests that can be carried out.
- Electric and mechanical schematics for the tests that can be carried out.
- Introduction into structure and operation of automation system.
- Configuration of the test stand in automation system.
- Preparation, execution and evaluation of manually and automatically operated tests.
- Structure and function of process computer with I/O.
- Booting of software.
- Structure and function of measuring system.
- Data acquisitions and post-processing.

- Equipment maintenance.

12. CERTIFICATION AND SAFETY RULES

Successful bidder will offer the declaration of CE-Conformity for all equipment and test areas:

- Clarification and screening of the documents on site.
- Consolidate the documents.
- Compile the documents for the CE Declaration.
- Verify the equipment on site.
- Preparation of CE Declaration.

All must be according to the EU Safety Rules.

13. DOCUMENTATION

The successful bidder will provide, in paper and in digital format:

- Electrical schematics for the ordered test areas and test benches.
- Mechanical assembly drawing for the ordered test areas and test benches.
- Specification document to support staff in the set-up of test benches and DUTs (power cables, communication interfaces, cooling supply,...).
- Manuals and operating instructions of all equipment and test benches in English.
- Technical documentation according to EC Machinery Directive.

14. WARRANTY

A warranty period of **2 years** is established from the date of reception of the equipment at MUBIL facilities with the agreement of the Technical Director of MUBIL Fundazioa. The warranty includes travel, labour, parts and spare parts necessary for the repair.

If during the aforementioned warranty period the existence of faults or defects in the goods supplied is demonstrated, MUBIL Fundazioa will have the right to demand from the successful bidder the replacement of the defective goods or their repair if that is considered sufficient.

If MUBIL Fundazioa considers, during the warranty period, that the supplied product is not fit for its intended purpose, as a consequence of the faults or defects observed in it and attributable to the successful bidder, and there is a presumption that the replacement or repair of the product will not be sufficient to achieve such purpose, it may, before the expiration of said period, request the replacement of the unit with a new one.

ANNEX I. DRAWING OF SPACE AVAILABLE FOR THE LABORATORY

Note that the section called “Labo. 3” and marked in green colour is the space available to build the hydrogen laboratory (both test areas, A3 and A4). The section called “Labo. 2” and marked in blue colour does not refer to this tender.

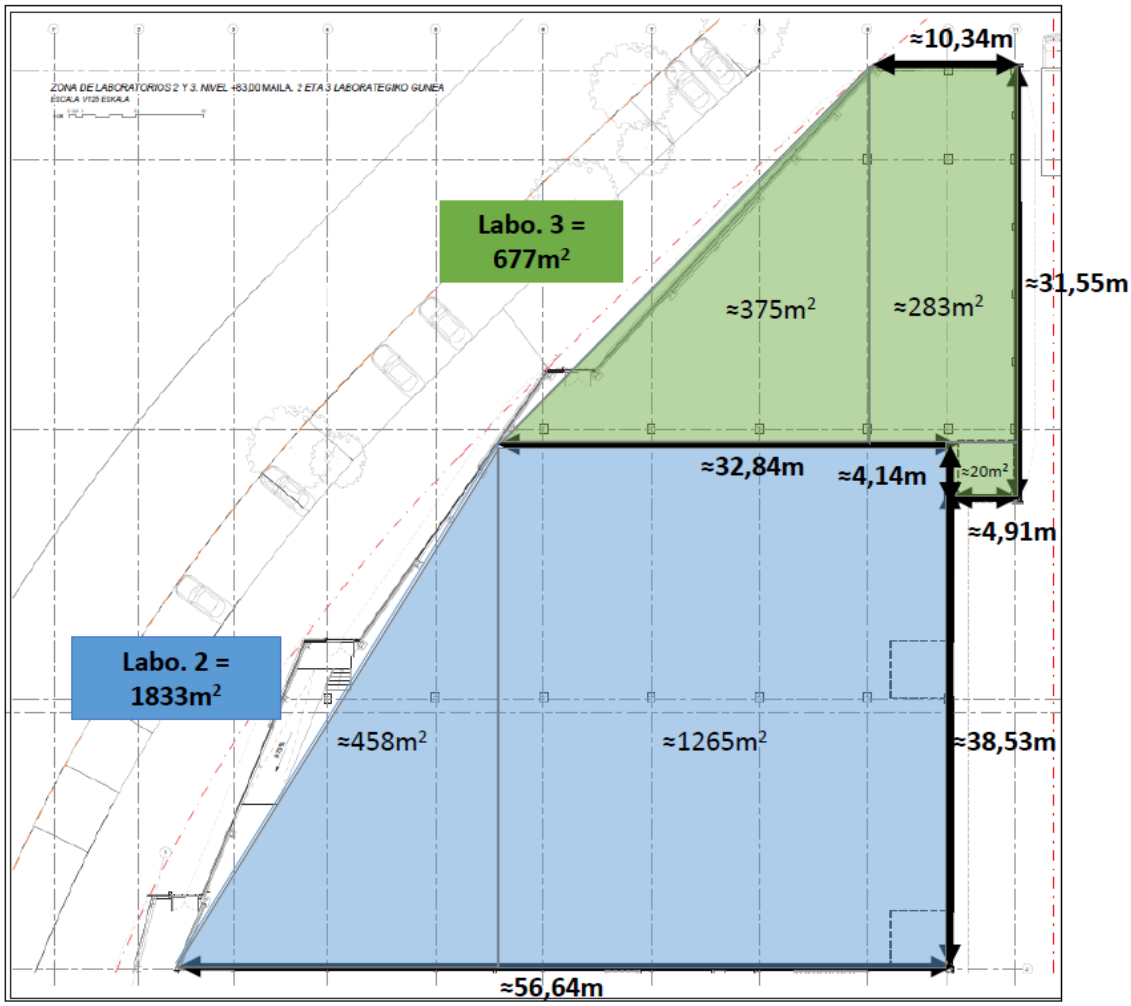


Fig. 2. Drawing of space available for the hydrogen laboratory in green.