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Development of a Strategic Plan for the Establishment of a Sustainable Road Research Capacity within the Research Division of the Roads Office in DR Congo

Appendix 2 to the Final Report- Financing of RRL Equipments (Translated from French)



SMEC Kenya Ltd

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Cover Photo

Source: UNDP in DR Congo

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Table of Contents

Table of Contents	3
11. ROAD RESEARCH LABORATORY (RRL) EQUIPMENT	4
11.1 Context of the study	4
11.2 Principles of RRL design	4
11.3 List and price of proposed basic equipment for RRL	5

11. ROAD RESEARCH LABORATORY (RRL) EQUIPMENT

11.1 Context of the study

Study on the "Development of a Strategic Plan for the Establishment of Sustainable Road Research Capacity within the Research Division of the Roads Office in the Republic of Congo" by SMEC recommended the creation of a Road Research Center (RRC) separate from the Research and Development Department (DRD) of the Roads Office (OdR). The new center must have a Road Research Laboratory (LRR) separate from the National Public Works Laboratory (LNTP). According to the Terms of Reference (ToR) received, the laboratory to be created must be intended for advanced Road Research (RR), including including service to the community for self-financing.

11.2 Principles of RRL design

A RR laboratory has two types of equipment, namely the usual equipment in road laboratories, for routine laboratory and field tests, and secondly, specific equipment purchased as an option or manufactured for a specific research program.

A well-equipped road laboratory must have several types of tools, equipment and materials, including equipment for geotechnical testing, equipment for physical and mechanical testing, equipment for chemical and mineralogical identification testing, as well as rheological testing on several types of binders, equipment for the formulation of various mixtures and manufacture of test samples, an electro-mechanical and plumbing workshop for various repairs, office equipment, etc.

In addition to the equipment itself, it is also proven that in Africa, and more particularly in DR Congo, equipment may be lacking due to the lack of consumables or common parts found elsewhere on the market. It is always advisable to accompany the equipment of certain stocks of consumables in first investment.

In addition, the road laboratory tool is increasingly digitized, motorized, automated and computerized, making it easier and more precise to measure, store and process.

The equipment manufacturers' catalogs generally provide the identification and references of the equipment, an explanatory note, a user's manual as well as factory prices or delivered prices.

Since the CRR's LRR is to be created from scratch and no RR program has been decided so far, the Consultant, starting from the list of materials proposed by the OdR DRD, from the list of potential areas, themes and examples of subjects, provided in the main report, and equipment commonly observed in road and RR laboratories, including that of the Polytechnic Faculty of the University of Kinshasa and the LNTP, chose to equip the CRR with equipment generally used during studies and road researches as a

first step. It goes without saying that, where appropriate, each RR project may acquire or install appropriate specialized equipment funded by the program.

11.3 List and price of proposed basic equipment for RRL

This report gives, in draft form, the list including the designation, the quantity, the factory unit price and the total factory price of the equipment, tools and some consumables retained for the created CRR. Prices do not include shipping, customs and assembly costs.

The estimate of the pre-project financing need for the usual equipment for the LRR is: 7.814 245 (Seven million eight hundred and fourteen thousand two hundred and forty-five) Euros.

Evaluation of the initial investment for the RRL of the RRC

		Subject	Description	No.	Unit Cost (€)	Total Cost (€)
		1. Aggregate				
		1.1 On-site sampling				
			Sampling rod	48	€ 25.00	€ 1,200.00
			Sampling tube: Consisting of 2 concentric tubes rotating relative to each other and allowing the sample to enter the tube without being able to leave it.	48	€ 30.00	€ 1,440.00
			Hand scoop stainless steel with handle, round bottom, dimensions (mm): 240x80, 285x100, 335x120, 340x140, 420x160	48	€ 450.00	€ 21,600.00
			Hand scoop stainless steel with handle, flat bottom, dimensions (mm): 210x70, 310x110, 340x130, 400x130, 600x400	48	€ 450.00	€ 21,600.00
			Undeformable stainless steel tray with handles, dimensions (mm): 315x230x60, 375x265x60, 600x400x100, 250x180x50, 300x225x55, 350x250x60, 400x280x65	48	€ 250.00	€ 12,000.00
		1.2 Preparation before analysis				
			jar crusher + Complete accessories, for particles smaller than 2 mm. Intended for fine powder grinding of all kinds of hard materials such as clinker, stone. Capacity: 1500 cc dimension 350x710x410	3	€ 2,600.00	€ 7,800.00
			Laboratory jaw crusher + accessories (jaw set) Particularly suitable for the crushing of aggregates, ores or other materials. Supplied with protection system Capacity 400 kg/ h	3	€ 3,500.00	€ 10,500.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		Sampler divider with adjustable channels + accessories (spare container), Comes with a set of 2 tanks of 22 litres Volume of the hopper: 30 litres	3	€ 650.00	€ 1,950.00
	1.3 Measuring the water content				
		Aluminum water box with lid Dia. 55 x 35 mm	150	€ 3.50	€ 525.00
		Electronic moisture meter, without sampling, directly on the site	48	€ 300.00	€ 14,400.00
		Moisture meter " Frying pan " (Stove + burner)	48	€ 150.00	€ 7,200.00
		407L Universal Air Concept Ovens	5	€ 4,500.00	€ 22,500.00
		1007L Universal Air Concept Ovens	5	€ 9,100.00	€ 45,500.00
		200 g Balances, sensitivity 0.01 g	5	€ 1,150.00	€ 5,750.00
		1000 g Balances, sensitivity 0.01 g	5	€ 1,150.00	€ 5,750.00
		Precision balance of 8000g / 0.01g	5	€ 1,200.00	€ 6,000.00
		30,000 g Balances, sensitivity 1 - 0,1 g	5	€ 1,850.00	€ 9,250.00
		16,000 g Balances, sensitivity 0,1 g	5	€ 525.00	€ 2,625.00
		Precision electronic scale with digital display Particularly suitable for weighing and water content of aggregates - Range 24 Kg/ 0.1g - Automatic tare and tare memory - Tray size: 160 x 200 mm - Supplied with calibration mass	5	€ 590.00	€ 2,950.00
		200 kg balances, sensitivity 100 g	4	€ 1,821.00	€ 7,284.00
	1.4 Bulk Density				
		Set of 4 steel Measuring vessels, capacity (L): 1, 5, 10, 20	24	€ 655.00	€ 15,720.00

		Pycnometer with air + accessories (standard block). Fast and reliable method for the determination of the absolute density, the water content and the porosity of aggregates Set comprising: * a 1 litre tank, * a pressure chamber with built-in pump, * a precision manometer.	4	€ 3,250.00	€ 13,000.00
		Sand pycnometer Pycnometer for measuring the density of sand and fine aggregates. 1000 ml glass bottle and aluminum stopper	4	€ 650.00	€ 2,600.00
		Pycnometer thick glass, wide neck, capacity (ml): 500, 1000, 2000, 5000	4	€ 390.00	€ 1,560.00
		Complete equipment for hydrostatic weighing (weighing 32 kg ± 0,1g, frame, basket, cradle, accessories)	4	€ 2,530.00	€ 10,120.00
		Cylindrical glass container, capacity (ml): 2000	48	€ 250.00	€ 12,000.00
	1.5 Void volume				
		Complete RIGDEN void index (consisting of two guide columns, one piston and one Ø 25 mm cylinder + caliper)	4	€ 650.00	€ 2,600.00
	1.6 Particle size analysis				
		Sieve sets made of perforated galvanized sheet steel + cleaning and sieving accessories, Ø 315, H 77, with base and lid Opening of the meshes (mm): 4 to 125, i.e. 30 sieves	5	€ 2,490.00	€ 12,450.00
		Screen sets made of woven cloth with reinforced canvas + cleaning and sieving accessories, Ø 315, H 77, with bottom and lid Opening of the meshes (mm): 0.040 to 3.15, i.e. 21 sieves	5	€ 1,770.00	€ 8,850.00
		Ultrasound for cleaning sieves Ø 315 mm	3	€ 2,300.00	€ 6,900.00
		Complete set of friability sieves, to determine the friability of aggregates	3	€ 1,350.00	€ 4,050.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		Economical sieving machine (Movement generated by an electric motor, Power supply: single-phase 230 V 50 Hz) + complete accessories	3	€ 1,620.00	€ 4,860.00
		Complete set of 13 slot grids + accessories For determining the flattening coefficient of the aggregates. According to EN 933-3 / NF P18-561. Openings: 2.5 mm - 3.15 mm - 4 mm - 5 mm - 6.3 mm - 8 mm - 10 mm - 12.5 mm - 16 mm - 20 mm - 25 mm - 31.5 mm - 40 mm	3	€ 1,950.00	€ 5,850.00
		Vernier vernier calipers for shape coefficient	10	€ 150.00	€ 1,500.00
		Large capacity sieving machine for sieves 457 x 660 mm Delivered with complete set of corresponding sieves. For sieving large quantities of materials (stone, sand, gravel ...). The device can hold 30 l of samples (60 to 70 kg of aggregates).	3	€ 5,600.00	€ 16,800.00
		Laboratory type air flow sieve The air flow system from the nozzles allows measurements up to 5 µm with microprecision screens. • Analysis range: 5 µm to 4 mm with Ø 200 mm sieves. The set includes: • Screening box with control of: - sieving time from 0 to 99 minutes, - depression value from 0 to 99 bar, - calibration function. Comes complete with vacuum cleaner, filter, vacuum bags, accessories and sieve sets	3	€ 4,300.00	€ 12,900.00
	1.7 Blue test				

		Complete equipment for methylene blue test according to standards comprising: - 1 finned stirrer, speed 15-2000 rpm with stand (presets at 400, 600 or 700 rpm), - 1 burette 50 cm ³ to 0.1 cm ³ with support and clamp, - 3 packs of 100 filters dia. 90 mm, - 1 glass rod ø 8x300 mm, - 1 graduated beaker 3000 ml and 2000 ml, - 1 square plastic box 150x150 mm	24	€ 900.00	€ 21,600.00
	1.8 Cleanliness tests				
		Complete set for sand equivalent comprising: * 4 graduated test tubes * 4 caps * 4 containers of 200 cm ³ * 1 funnel * 1 washing tube with faucet * 1 siphon and plastic bottle of 5L * 1 calibrated piston * 1 spatula * 1 stainless steel spoon * 1 ruler of 500 mm * 1 agitator	24	€ 440.00	€ 10,560.00
	1.9 Angularity				
		Full sand angulometer + accessories Used to measure the angularity of sands used in pavement layers or in concrete.	5	€ 540.00	€ 2,700.00
		Standard sand	5	€ 560.00	€ 2,800.00
	1.10 Abrasion test				

		Machine for the accelerated polishing of chippings + complete accessories The purpose of the test is to provide a relative measure characterizing the ability of road chippings to polish under the effect of traffic. The test consists of two phases: • Polishing action with the machine. • Final roughness measurement with SRT pendulum	3	€ 5,500.00	€ 16,500.00
		Friction pendulum complete with accessories For determining the roughness of a surface and the accelerated polishing coefficient.	3	€ 4,500.00	€ 13,500.00
		Complete Micro-Deval machine + accessories For the determination of the quality of aggregates, delivered with protection grid and electrical safety system. • Digital indication of the test time and backup of the elapsed time in case of power failure	3	€ 9,000.00	€ 27,000.00
	1.11 Impact resistance test				€ 0.00
		LOS ANGELES WITH PHONIC PROTECTION for the measurement of wear resistance of aggregates according to standard NF EN 1097-2	3	€ 6,500.00	€ 19,500.00
		Dynamic fragmentation machine + complete accessories For the determination of the impact resistance of aggregates.	3	€ 4,500.00	€ 13,500.00
	1.12 Tests to determine the chemical properties of aggregates		3	€ 4,480.00	€ 13,440.00

		1.13 Measurement of spread rate for chippings				
			RATE OF SPREAD FOR CHIPPINGS The device makes it possible to check the application rate of the chippings. Composed of a 300mm square board suspended by four chains to a scale that allows direct reading in kg/ m ²	5	€ 230.00	€ 1,150.00
			Precision electronic scale with digital display - Scope 6200 g / 0.01 g, - Tray 170 x 170 mm, - External calibration by mass standard, - Hydrostatic weighing	5	€ 1,180.00	€ 5,900.00
		2. Cement and mortar				
		2.1 Specific area				
			Blaine Permeabilimeter Automatic Time Measurement Fully automatic measuring cycle with tightness control between the cell and the pressure gauge, minimum liquid level detection, drain cock. The coefficient of permeability k is determined automatically depending on the characteristics of the standard cement.	3	€ 4,200.00	€ 12,600.00
		2.2 Density				
			Sieve funnel and filter For measuring the apparent density of cements. • Delivered with sieve funnel, screed and measuring 1 litre of machined plastic.	5	€ 320.00	€ 1,600.00
			Apparent density apparatus Delivered complete with 1 litre container and closing flap.	5	€ 560.00	€ 2,800.00
		2.3 Identification				

		<p>Complete Sets for Quick Identification of Cements + (Hardware, Accessories, Products)</p> <p>Apparatus for recognizing cements comprising:</p> <ul style="list-style-type: none"> • 6 20 ml graduated test tubes. • 1 tube holder. • 6 caps for tubes. • 1 bottle of 250 ml. • 1 dropper bottle for nitric acid. • 1 dropper bottle for silver nitrate. • 2 magnetic bars. 	3	€ 2,340.00	€ 7,020.00
		<p>LE CHATELIER DENSITOMETRE</p> <p>For the determination of the absolute density of cements</p> <ul style="list-style-type: none"> • Volume: 250 ml. • Capacity: 250 cm³. • Double graduation of 0 to 1 ml and 18 to 24 ml in steps of 0.1 ml. • Flared filling port. • Ground glass stopper. 		€ 130.00	€ 390.00
		<p>Langavant calorimeter + complete accessory (laptop and software)</p> <p>For measuring heat of hydration of cements by semi-adiabatic calorimetry (Langavant method). After mixing, introduce 1.575kg of cement or mortar into a mortar box, then place the specimen in a calibrated calorimeter. The Cemtech measuring chain records the temperature released during the setting of the cement and compares it to the reference temperature. The software calculates the heat of hydration and heating and allows to produce a test report. With the possibility of modifying the binders according to their specific thermal capacity.</p>	3	€ 7,600.00	€ 22,800.00
	2.4 Equipment for Mortar preparation				

		5 LITRE AUTOMATIC MIXER for standardized mortar and cement Automatic cement mixer in accordance with EN 196/1 and EN 196/3 * Fully automatic cycle * Automatic sand supply according to EN 196/1 * 3-position selector: manual and automatic operation according to EN 196/1 and EN 196/3 * Two planetary rotation speeds 140 and 285 rpm * Automatic shutdown when opening the protection door	3	€ 4,400.00	€ 13,200.00
		Set of Cuvoscopes for mixers Used to measure the gap between the tank and the pallet of a standard mixer. Set of two cuvosscopes: Ø 2 and 4 mm. Supplied with certificate	3	€ 150.00	€ 450.00
	2.5 Determination of the stiffening time				
		Equipment for measuring stiffening time + complete accessories. Apparatus for determining the practical duration of use. Supplied complete with penetration rod, aluminum container and lid diameter 90 mm, height 60 mm.	5	€ 890.00	€ 4,450.00
		Extensometer for plaster Extensometer for consistency of plaster. The equipment includes a frame 100 x 60 x 25 mm deep of which one end is fixed and the other mobile. On the moving end side, a comparator of 10 mm to 0.01 mm measures the expansion.	5	€ 820.00	€ 4,100.00
	2.6 Consistency				
		Diver for consistency test + complete accessories Used to measure the consistency of a fresh mortar and construction lime. The apparatus consists of: • Base with a support on which a measuring vessel rests. • Hemispherical end diver with a graduated gauge of 90 g ± 2 g. • Release mechanism.	3	€ 1,350.00	€ 4,050.00

			<ul style="list-style-type: none"> • Compaction probe. 			
			<p>Electric shaking tables for alkaline reactivity tests, lime and mortar + complete accessories To determine alkali reactivity of aggregates. To determine the consistency of mortars and lime. The electric tables are equipped with a digital counter and a programmable device in a separate control box.</p> <ul style="list-style-type: none"> • Delivery: with mold and shank. 	3	€ 3,800.00	€ 11,400.00
		2.7 Workability				
			<p>Mortar workability-meter + complete accessories For the determination of the dynamic workability of concrete mortars. The device consists of a compartment divided in 2 unequal volumes by a removable wall. The test consists of measuring the time taken by the mortar to flow from the large volume to the small volume under the action of the vibration.</p>	3	€ 2,568.00	€ 7,704.00
		2.8 Setting time/ Vicat test				

		<p>AUTOMATIC VICAT MONOPOSTE + complete accessories Single automatic Tropical Vicat Prisometer Measurement of setting time of cements & mortars Tests according to pre-programmed standards _ EN 196-3, _ BS 4550, _ ASTM C 191-65, _ DIN 1168 Plasters - EN 13279-2 plasters 2 modes of operation:</p> <ul style="list-style-type: none"> • Automatic mode containing 5 pre-programmed standards and possibility of managing penetration parameters according to the chosen standard. • Free mode with 5 fully customizable tests: number of penetrations, delayed start, position, intervals between penetrations, free fall or accompanied, alarm for start of setting. 	3	€ 2,900.00	€ 8,700.00
		<p>Automatic multi-station cement mortars prisometer + complete accessories, For the determination of the setting time of cements, mortars and plaster. Two modes of operation: Automatic mode with 5 pre-programmed standards and management of penetration parameters according to the chosen standard. Free mode with 5 fully configurable tests: number of penetrations, delayed start, position, intervals between penetrations, free fall or accompanied, alarm for start of setting. Features:</p> <ul style="list-style-type: none"> • Display of the test progress. • Test memory: up to 50 tests. • Settings and printer test chart. • RS232 output: for transferring the test memory. • Power supply: single-phase 230 V 50 Hz. • Power: 50 W. 	3	€ 2,900.00	€ 8,700.00
	2.9 Tests on fresh mortars				
		<p>1 litre mortar aerometer To measure the air trapped in the cements.</p> <ul style="list-style-type: none"> • High reading accuracy. • Manometer with direct reading of the trapped air. • Built-in manual pump. 	3	€ 2,350.00	€ 7,050.00

		Retention test apparatus For the determination of the water retention value of cements and lime. Comes complete with stand, funnel, perforated metal disc, manometer, filter paper, glassware and accessories.	3	€ 2,650.00	€ 7,950.00
		Pump Provides a vacuum of 650 mm HG. • Air flow 2 m ³ / h.	3	€ 2,360.00	€ 7,080.00
	2.10 Making test specimens				
		4 x 4 x 16 expanded polystyrene mold Designed for making 4 x 4 x 16 specimens in a fluid mortar that does not require vibration or impact.	24	€ 540.00	€ 12,960.00
		4x4x16 3-cell prismatic mold - fine grinding for bending or shrink compression testing * In accordance with EN 196-1, * Hardness greater than 340 HV on all sides * Roughness = 0.20, * Each mold is numbered and engraved, * Assembly by screwing on the upper face, * Adaptable to Perrier E0134 impact tables, * Comes with certificate of control * Dimensions of the base plate: 200 x 220 x 50 mm	24	€ 1,500.00	€ 36,000.00
		Measuring studs: complete set For measuring the shrinkage of the specimen. To be fixed in the shrinkage mold before making the test piece using the screws.	24	€ 650.00	€ 15,600.00
		Mold for crackability tests To determine the time of appearance of a crack on a standard test piece. • Dimensions: 230 x 150 x 60 mm.	24	€ 310.00	€ 7,440.00

		2.11 Clamping of test specimens				
			Standard impact table for setting up mortar in 4x4x16 molds + complete accessories + sound insulation box	3	€ 5,400.00	€ 16,200.00
		2.12 Preservation of test specimens				
			<p>Stainless steel thermostatic bath, capacity 200 litres For the conservation of specimens in a temperature range from ambient to + 60 ° C. Regulation from 0.4 ° C to + 20 ° C. Bath equipped with a digital controller with security. Double wall stainless steel with insulation and internal water circulation system to maintain a uniform temperature in the bath. Has inlet and outlet for connecting a refrigerant unit if the set temperature is lower than the ambient temperature.</p> <ul style="list-style-type: none"> • Dimensions int. : 900 x 600 x 360 mm. • Ext. : 1050 x 680 x 430 mm. • Power supply: 230 V 50 Hz. 	3	€ 6,370.00	€ 19,110.00

		<p>600 l spray Wet cupboard For the preservation of cement or mortar specimens molded or demoulded from a volume of 600 litres. Air conservation of 15 moulds on 3 shelves. Preservation in water, 72 test samples in 3 trays. Technical characteristics:</p> <ul style="list-style-type: none"> • Temperature maintenance without refrigerating unit: by heating resistance for water supply temperature less than 20°. • Temperature maintenance per cooling unit E0138 / 1:20°C ± 1°C (optional) Humidity:> 90%. • Temperature regulation by electronic regulator. • Spraying water with compressed air (20l/ minute). • Power: 2,000 W. • Dimensions int. : 1090 x 470 x 1200 mm. • Dimensions: 1370 x 540 x 1490 mm. • Power supply: 230 V 50 Hz single phase. 	3	€ 7,320.00	€ 21,960.00
		<p>Cold production By refrigeration unit to be connected to 600l wet cabinet for maintaining the temperature at 20 ± 1 ° C.</p> <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz single phase. • Power: 750 W. • Dimensions: 550 x 500 x 880 mm. 	3	€ 5,500.00	€ 16,500.00
		<p>Production of compressed air Air consumption: 200 l / min. By compressed air or compressor circuit (greater than 2 bar). Compressed air compressor 400 l / min - 200 l tank, delivered with 10 m of flexible connecting pipe.</p> <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz single phase. • Power: 400 W. • Dimensions: 600 x 600 x 1000 mm. 	3	€ 2,550.00	€ 7,650.00
	2.13 Tests on hardened material				

		<p>Analog refractometers + complete accessories and calibration rod For the determination of linear variations of 4 x 4 x 16 cm specimens, 7 x 7 x 28 cm.</p> <ul style="list-style-type: none"> • 1/1000 needle comparator. • Dimensions: 180 x 180 x 490 mm. • Weight: 10 kg 	3	€ 650.00	€ 1,950.00
		<p>Digital refractometers + complete accessories + calibration rod and acquisition software For determination of variations linear samples 4 x 4 x 16 cm, 7 x 7 x 28 cm.</p> <ul style="list-style-type: none"> • Electronic comparator with 12 mm / 0.001 mm, RS232 output for acquisition. • Dimensions: 180 x 180 x 450 mm. • Weight: 10 kg 	3	€ 1,250.00	€ 3,750.00
	2.14 Expansion				
		<p>Le Chatelier Kettle. It can treat up to 12 Le Chatelier mussels (to be ordered separately). Two heating resistors of 900 W allowing it to reach the boiling point in 30 min ± 5 min. A regulator prevents the evaporation of water during the test.</p>	3	€ 3,520.00	€ 10,560.00
		<p>Control of needle molds, Control tools for needle molds with a weight of 300 g.</p> <ul style="list-style-type: none"> • Dimensions: 180 x 70 x 150 mm. 	3	€ 240.00	€ 720.00
		<p>Glass plate: 50 x 50 mm,</p>	5	€ 85.00	€ 425.00
		<p>Le Chatelier Needle mould To determine the stability of the cement. Each mold is numbered by laser marking.</p> <ul style="list-style-type: none"> • Dimensions: 30 x 30 x 150 mm. 	12	€ 65.00	€ 780.00
	2.15 Determination of				

		mechanical performance				
			PRESS 250KN / 15KN type CYBERTRONIC Compression machine of 250 kN intended for compression and 15 kN intended for the bending of cement and mortar specimens 4x4x16cm. Delivered with compression and bending devices, acquisition Software for Press control Delivered with protective guards + safety door opening switch.	3	€ 9,220.00	€ 27,660.00
		2.16 Other tests				
			Measurement of the heat of hydration by dissolution in an acidic solution The method consists of measuring the heats of dissolution of a cement mixture in an acid medium for 7 days. Delivered complete with Dewar vase protected in its wooden chest, constant speed electric mixer, Beckman centesimal thermometer and funnel to introduce the cement. • Power supply: 230 V 50 Hz single phase. • Power: 150 W. • Dimensions: 350 x 250 x 650 mm.	3	€ 2,680.00	€ 8,040.00
			Electric autoclave for cement expansion test Aluminum metal autoclave of internal dimensions Ø 154 x 430 mm, heated by an electric resistor with pressure regulator and safety valve for expansion tests of the cements. • Power supply: 230 V 50 Hz single phase. • Power: 3500 W. • Dimensions: 450 x 480 x 1080 mm.	3	€ 2,850.00	€ 8,550.00

		Set for fineness determination by wet sieving Including a sieve Ø 50 mm in stainless steel mesh of 0.045 mm, a nozzle Ø 17.5 mm with 17 holes Ø 0.5 mm, a pressure gauge Ø 80 mm 0 - 160 kPa / 5 kPa and mounting fittings on a water supply. • Dimensions: 200 x 300 x 50 mm.	5	€ 560.00	€ 2,800.00
		Stability test of hydrated lime and plaster Mold used for stability testing of hydrated lime or plaster. Ring Ø 100 mm inside, thickness 5 mm with inner cone frustum of 5 °. Comes complete with glass base. (Delivered 3 molds per kit.)	5	€ 630.00	€ 3,150.00
		Cement Sampler Tubes To take samples of cements in bags or in bulk depending on the model.	48	€ 150.00	€ 7,200.00
	3. Concrete				
	3.1 Tests on grout				
		Abrams cone made of galvanized steel with quick fastening and stem including: - 1 support plate with 2 handles - 1 standard cone with 2 handles and brackets - 1 system with stem - 1 rod of L 600 mm and Ø 16 mm - 1 funnel - 1 hand scoop	48	€ 490.00	€ 23,520.00
		Baroid Balance For the simple and accurate determination of the density of grouts, mortars and drilling muds. Its robust construction makes it an ideal instrument for the construction site. Delivered in a plastic box.	12	€ 650.00	€ 7,800.00

		<p>Marsh cone or Marsh's viscometer For determining the viscosity of grouts. • Nozzle Ø 4.76 mm. Made of plastic very resistant to temperature variations. Delivered with graduated bowl of 1 l.</p>	12	€ 750.00	€ 9,000.00
		<p>Viscometer of Fann For the measurement of the rheological properties of fluids. A synchronous motor provides a wide range of controlled shear rates. Data displayed continuously on a calibrated scale makes it easy to observe any variation in time. • 6-speed laboratory model. • Power supply: 220 V - 50 Hz. • Dim.: 390 x 150 x 270 mm. Comes complete</p>	3	€ 5,640.00	€ 16,920.00
		<p>Filter press For the determination of filtration properties of drilling muds and grout. Comprising: • 25 ml graduated cylinder. • Box of 100 paper filters. * Pack of 10 CO2 cartridges</p>	3	€ 1,250.00	€ 3,750.00
		<p>Elutriometer For sieving the sand content of mortars and drilling muds. Delivered with funnel, rise, sieve and graduated receiver.</p>	24	€ 360.00	€ 8,640.00
	3.2 Concrete making in the laboratory				

		Concrete mixer with capacity 100 L Last generation mixer > Useful volume 60-80 litres > 3 scraper arms (2 tank bottom, 1 wall scraper) > 45 rpm rotation speed > Protective grid with tearing bag > 2 large wheels + 2 small ones for easy transport > Walking foot for easier filling > Tank draining by hatch	3	€ 4,100.00	€ 12,300.00
		Planetary rotation laboratory mixers: Capacity 40 L	3	€ 1,890.00	€ 5,670.00
	3.3 Tests on fresh concrete				
		Vebe Consistometer For determining the workability of fresh concrete, variant of the Abrams Cone test. After passing through the cone, the concrete is subjected to vibrations. The time spent recompacting the concrete indicates the degree of consistency. • Power supply: 230 V - 50 Hz. • Power: 250 W. • Dimensions: 260 x 380 x 700 mm.	3	€ 1,350.00	€ 4,050.00
		Concrete Maniabilimeter For determining the workability of concretes under the action of a given vibration. • Volume of concrete: about 30 litres. • Power supply: 230 V 50 Hz single phase. • Power: 300 W. • Dimensions: 820 x 420 x 410 mm.	3	€ 350.00	€ 1,050.00

		<p>Motorized shaking table for concrete according to ASTM C 124-71 and AASHTO T120 Designed to measure the fluidity of coarser concretes. (max diameter: 38mm)</p> <p>Supplied complete with:</p> <ul style="list-style-type: none"> - frustoconical mold diameter 254 / 171mm Height 127mm - compacting pestle diameter 16mm height 600mm 	3	€ 3,800.00	€ 11,400.00
		<p>Mini cone made of stainless steel</p> <p>For rheological measurement by slump of products facade.</p> <ul style="list-style-type: none"> • Dimensions: Ø 5 / Ø 10 cm. • Height: 15 cm. 	24	€ 150.00	€ 3,600.00
		<p>Concrete plasticimeter</p> <p>For the rapid determination of the plasticity of concrete.</p> <p>The values obtained are approximately same as those in the Abrams Cone.</p> <ul style="list-style-type: none"> • Dimensions: 370 x 120 x 111 mm. 	5	€ 2,250.00	€ 11,250.00
		<p>Abrams cone</p> <p>Comprising:</p> <ul style="list-style-type: none"> • 1 base plate. • 1 cone. • 1 funnel. • 1 stitching rod. • 1 hand scoop. • 1 measuring ruler: length 300 mm. 	12	€ 570.00	€ 6,840.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		<p>Abrams cone made of galvanized steel with quick attachment and stem</p> <p>Comprising:</p> <ul style="list-style-type: none"> • 1 support plate with 2 handles. • 1 standard cone with 2 handles and brackets. • 1 system with stem. • 1 shank of L 600 mm - Ø 16 mm. • 1 funnel. • 1 hand scoop. • Dimensions: 480 x 410 x 340 mm. 	12	€ 1,250.00	€ 15,000.00
		<p>Slump test table</p> <p>This test is particularly adapted to very fluid concretes, strongly dosed in superplasticizer.</p> <ul style="list-style-type: none"> • Dimensions: 700 x 700 mm. <p>Supplied complete with spare cone and pestle</p>	3	€ 3,900.00	€ 11,700.00
		<p>Handling tester</p> <p>To determine the compactness and maneuverability of fresh concrete</p>	24	€ 350.00	€ 8,400.00
		<p>PVC plate for spreading test</p> <p>For the measurement of spreading.</p> <ul style="list-style-type: none"> • PVC with protective film. • With concentric circles of Ø 200-500-600-700-800 mm. • Carry handle. • Dimensions: 905 x 905 mm. 	24	€ 540.00	€ 12,960.00
		<p>Slump test device</p> <p>Comprising:</p> <ul style="list-style-type: none"> • A galvanized steel cone. • A 905 x 905 mm galvanized steel base plate with two engraved Ø 210 and 500 mm circles. 	24	€ 370.00	€ 8,880.00

			<p>Flow time measurement Comprising:</p> <ul style="list-style-type: none"> • A 10-litre stainless steel funnel with a shut-off valve at the bottom. • Rectangular section bar made of galvanized steel, length 900 mm. • Optional: a plastic tray. 	24	€ 670.00	€ 16,080.00
			<p>Joisel stainless steel appliance For the quick determination of proportions of the different elements constituting the fresh concretes. Normal model</p> <ul style="list-style-type: none"> • Ø 14 cm - H 22 cm. 	24	€ 760.00	€ 18,240.00
			<p>Pocket Penetrometer (Concrete) Penetration area 32 mm². The resistance is displayed in kPa and Lb / in².</p>	12	€ 350.00	€ 4,200.00
			<p>Concrete penetrometer Capacity 100 kgs. Delivered with 6 section points 16-32-65-160-325-650 mm² in a carrying case.</p> <ul style="list-style-type: none"> • Dimensions: 450 x 160 x 70 mm. 	12	€ 1,320.00	€ 15,840.00

		<p>4-channel temperature recorder - 195 + 1000°C 4 external channels for type K thermocouples (not supplied). Particularly interesting to measure and store in memory the temperature of concrete and evaluate the maturation. Start of on-site measurements using the GO key. Programmable measurement frequency of 2 sec. at 24H. Device programming and transfer of values to PC using the supplied software running Windows®. Display values on PCs as tables or diagrams.</p> <ul style="list-style-type: none"> • Resolution: 0.1°C. • Memory capacity: 48,000 values. • Power supply: Lithium battery with 5 years autonomy. • Dimensions: 103 x 64 x 33 mm. <p>Delivered with connector (4 units), K type shielded thermocouple (Teflon sheath max. Length 70 m), probe with handle, 1.5 m twisted PVC cable and connector</p>	24	€ 760.00	€ 18,240.00
		<p>AEROMETER OF 8 LITRES Concrete aerometer complies with EN 12350-7 capacity 8 litres, equipped with an electric compressor to keep a constant air pressure. Comes complete with user manual and calibration kit.</p>	24	€ 2,100.00	€ 50,400.00
	3.4 Making test specimens				
		Cylindrical steel molds Ø 15 - H 30 + screeds (set of 12 molds)	24	€ 1,560.00	€ 37,440.00
		Cylindrical molds Ø 16 - H 32 + screed (set of 12 molds)	24	€ 1,800.00	€ 43,200.00
		15 x 15 cm cubic steel mold (set of 12 molds)	24	€ 1,560.00	€ 37,440.00
		Steel Prismatic Mold Sets (2x2x16, 4x4x16, 7x7x28, 10x10x40, 14x14x56, 15x15x60, 20x20x80)	24	€ 1,050.00	€ 25,200.00
		Universal electric vibrating needle Ø 25 mm and 35 mm	5	€ 1,900.00	€ 9,500.00

		<p>Vibrating needle Ø 25mm, battery supply Fully autonomous equipment powered by 1 b 12 V battery. Vibrates 20 to 30 concrete specimens Ø 16 cm H 32 cm with a single battery. Box comprising:</p> <ul style="list-style-type: none"> • Electric motor: 12,000 vibr / min. • Vibrating needle of about 1 meter. • 2 rechargeable 12 V batteries. • 1 charger 220 V / 12 V. 	5	€ 650.00	€ 3,250.00
		<p>Electric vibrating table delivered complete</p> <ul style="list-style-type: none"> • Vibration frequency: 3000 vibr / min. • Power supply: 220 V mono or 380 V tri. • Delivered with clamping flange. 	3	€ 4,100.00	€ 12,300.00
	3.5 Sample collection				
		<p>Portable carter with gasoline engine. Simple and robust to use for sample extraction of concrete.</p> <ul style="list-style-type: none"> • Allows 360 ° coring. • 2-speed electric motor: 420 and 900 rpm. • maximum core diameter: 200 mm. • Stabilizing foot and fixing system by screw jack with extension column. • Power supply: 220 V mono. • Power: 2,200 W. • Dimensions: 750 x 440 x 1300 mm. 	3	€ 2,500.00	€ 7,500.00

		<p>New generation electric core drill</p> <ul style="list-style-type: none"> > Ø of drilling: from 20 to 300 mm > 3420 W Electric Motor > Rotation speed (rpm): 330 - 520 - 965 > Vertical feed speed: 1 > mounting thread 1"1/4 for fixing crowns > Ring for rapid disassembly of crowns > Fast fixing system between engine and column (a simple joystick to operate) > 630 mm course > Tilt column at 0 to 45 ° continuously > Handwheel with 4 branches, removable and bilateral control > Base plate equipped - with 2 wheels at the back - An anchoring system (5 pegs supplied) > Level for location of horizontal position on the engine support > Quick coupling for water supply <p>Delivered with a set of 10 diamond rings Ø 20 - 300 mm - 1 "1/4</p> <ul style="list-style-type: none"> > For concrete and asphalt > Effective length: 450 mm > Length: 480 mm > Female connector 1 "1/4 	3	€ 11,150.00	€ 33,450.00
	3.6 Preservation of test specimens				
		<p>Full steel thermostatic bath + accessories</p> <p>Hot-cadmium-plated thermostatic bath for the preservation of concrete specimens at 20 ° C. Can hold about 30 test specimens on one level and 56 on 2 levels with removable media.</p> <p>Temperature regulation by heating thermoregulator immersed in the bath.</p> <ul style="list-style-type: none"> • Size: 1500 x 750 x 750 mm. • Power supply: 230 V 50Hz single phase. • Power: 2000 W. 	3	€ 1,960.00	€ 5,880.00

		<p>humidifier Air humidifier for specimen storage chamber. allows to obtain a relative humidity (RH) of 95% by atomization of water in particles of Ø 1 µ.</p> <ul style="list-style-type: none"> • Yield: 0.8 kg / h. • Air flow: 200 m³ / h. • Maximum water pressure: 1,5 bar. • Power supply: 220 V 50 Hz single phase. • Dimensions: H 300 mm - Ø 420 mm. 	3	€ 2,350.00	€ 7,050.00
	3.7 Trimming of test specimens				
		<p>Complete concrete saws + accessories These machines have been designed to precisely cut any type of material, especially concrete and rock, up to a 180 mm diameter without turning (with diamond blade of different diameters). Equipped with a watering system with pump unit.</p> <ul style="list-style-type: none"> • Supplied with blades (diamond blades Ø 450 mm and Ø 350 mm, plain blade Ø 500 mm), clamping device (for cutting cylindrical cores Ø up to 200 mm, Dimensions: 400 x 240 x 400 mm), Device for cutting irregular samples (Dimensions: 400 x 300 x 400 mm), Cutting device in length (Allows cutting a specimen 16 x 32 mm lengthwise). • Power supply: 380 V three-phase. • Power: 2,200 W. • Blades: 350 mm or 450 mm. • Dimensions: 1,390 x 700 x 1,200 mm. 	3	€ 5,500.00	€ 16,500.00

		<p>Portable saw For cutting samples.</p> <ul style="list-style-type: none"> • Max. Blade Ø 350 mm. • Rotation speed: 3,900 rpm. • Power supply: 220 V - 2000 W. • Fixing device provided. • Blade provided (diamond blade Ø 350mm). • Dimensions: 560 x 460 x 390 mm. 	3	€ 2,280.00	€ 6,840.00
		<p>Concrete test specimen grinding machine This compact machine makes it possible to grind a standard cylindrical or cubic test piece. Type of test specimens:</p> <ul style="list-style-type: none"> • Cylindrical: 16 x 32 and 11 x 22. • Cubic: 20 x 20. <p>Test tube placed horizontally. Fixed spindle equipped with an abrasive monoblock head. Automatic lateral movement by geared motor. Mechanical guidance by bushings and treated shafts. Automatic programmable test specimen: height and depth of passes. Watering in closed circuit with settling tank. Fully covered machine with safety contact when opening the door. Supplied with diamond disc. Characteristics:</p> <ul style="list-style-type: none"> • Depth of pass from 0.1 to 1 mm. • Diamond rotation speed of 1400 rpm. • Feed speed of 1.5 m / min with automatic reversing at the end of stroke. • Automatic braking of the spindle by a power failure brake. • Work table allowing the fixing of specimens Ø 220 and 320 mm. • grinding wheel Ø 310 mm (grinding wheel supplied). • Fixing device to be provided in addition. • Power supply: 380 V three-phase. • Power: 4 kW. • Dimensions: 1150 x 750 x 1700 mm. 	3	€ 3,280.00	€ 9,840.00

		<p>5 litres Heating pot, Useful capacity 2.5 l. For sulfur surfacing of cylindrical specimens concrete and all other types of test specimens. Complies with safety standards.</p> <ul style="list-style-type: none"> • Thermostat flanged at 140 ° C avoiding any possibility of sulfur ignition. 	12	€ 110.00	€ 1,320.00
		<p>Pair of elastomer plates For the compression of blocks. Replaces traditional surfacing (cement paste or sulfur).</p>	12	€ 150.00	€ 1,800.00
		<p>Pair of neoprene discs</p>	12	€ 180.00	€ 2,160.00
		<p>Surfacing square for specimens With rollers and lever release system Comes in set of 3 squares (11x22, 15x30 and 16x3 2)</p>	12	€ 750.00	€ 9,000.00
		<p>Pair of caps for quick surfacing Ø 160 x 320 mm</p>	12	€ 250.00	€ 3,000.00
		<p>Gripper for gripping specimens Ø 16 x 32 cm</p>	12	€ 250.00	€ 3,000.00
		<p>Lifting device For specimen Ø 16 x 32 cm.</p>	12	€ 250.00	€ 3,000.00
		<p>Filtration type hood "Alegro" delivered with extraction pipe Particularly suitable for the recovery of sulfur vapors during surfacing test specimens. Characteristics:</p> <ul style="list-style-type: none"> • Lighting: ramp of 40 W x 2. • Operation indicator. • Upper discharge outlet Ø 120 mm. • Power 125 W x 2 motors. • Power supply: 220/240 V - 50/60 Hz. • Suction power 400 m³ / h. • 2 vertical turbines. • 3 speed selector. • Dimensions: 596 x 500 x 800 mm. 	12	€ 560.00	€ 6,720.00

		Leveling in cast-iron Especially used for surfacing blocks. • Dimensions: 600 x 400 mm.	12	€ 1,530.00	€ 18,360.00
	3.6 Auto control				
		Calibration suitcase This case allows calibration and verification of class 1 and 2 compression machines. • With each use, storage of 3 calibration programs with 10 values each. • Possible connection to any calibration cell (above) on the measuring channel. • Graphic screen 320 x 240. • Direct display of force in kN, lb or ton. • Storage of 525 000 points. • Connection up to 10 cells. Delivered without printer, in a carrying case. • Power supply: 240 V 50 Hz single phase. • Dimensions: 360 x 300 x 200 mm. Comes with a set of 3 electronic calibration cells (100kN, 30 0kN, 1000kN and 3000kN) + PC acquisition software compliant with EN 10002-3 / ASTM E74	3	€ 4,500.00	€ 13,500.00
		Footmeter: device for measuring the alignment of the center of thrust 1. Microprocessor measuring device: Reading of 4 generators simultaneously. The values are stored and the results of the calculations are displayed directly. • Power supply: 240 V 50 Hz single phase. • Dimensions: 450 x 350 x 160 mm. 2. The measuring cell Capacity 3000 kN. Equipped with 4 gauge bridges to measure the deformation on 4 generators. A 5 th gauge calibrates the machine. 3. Positioning set	3	€ 2,650.00	€ 7,950.00

			To ensure correct positioning of the cell			
		3.7 Mechanical resistance				
			1500 kN 4-column compression machine for standard cylinder tests 16 x 32 cm and cubes 15x15 cm	3	€ 7,100.00	€ 21,300.00
			<p>Footmeter type compression machine Capacity 3000 kN, slave For 16 x 32 test piece and 25 x 25 block.</p> <ul style="list-style-type: none"> • Passage between trays for blocks 290 mm. • Passage between cylindrical plates 336 mm. • Compression trays for 16 x 32 Ø 287 x 60 mm. • Compensation blocks on request. • Power supply: 230 V 50 hz single phase. • Power: 750 W. • Allows the use of a closed door splitting device. 	3	€ 12,500.00	€ 37,500.00

			<p>Universal splitting-tensile strength device, indirect tension for cylindrical specimens of 10x20 - 15x30 - 16x32 cm Allows splitting tests on specimens. The device is placed between the plates of any compression test press whose spacing is 340 mm. • Dimensions: 180 x 360 x 320 mm. Comes with a batch of 100 loading tapes</p>	3	€ 590.00	€ 1,770.00
			<p>Centrifuge for specimens For 150 x 150 or 100 x 100 mm test specimens. Tray Ø 287 mm.</p>	3	€ 320.00	€ 960.00
			<p>3 or 4 points flexure device For prism: 15 x 15 x 56. Sideward movable blade. Articulated lower and upper blades. Possibility of flexing 3 points. To be inserted in the test space of a compression machine equipped with a suitable calibration scale (between 0, 100 or 200 kN maximum).</p>	3	€ 750.00	€ 2,250.00
			<p>Spacer blocks for crushing specimens of different sizes Ø 140 mm: H 50 mm, 100 mm, 176 mm, 226 mm Ø 200 mm: H 50 mm, 76 mm, 126 mm Ø 210 mm: H 50 mm, 76 mm</p>	3	€ 1,250.00	€ 3,750.00
			<p>Mechanical Extensometer For measuring the deformation of a cylindrical specimen during the compression test. Composed of a stirrup with electronic comparator 1/1000e and printer output.</p>	3	€ 620.00	€ 1,860.00

		<p>Modulus of elasticity in compression on cylindrical specimens</p> <ul style="list-style-type: none"> • Acquisition system with automatic drawing of the modulus of elasticity in compression on specimens Ø 16 H 32 cm. <p>Comprising:</p> <ul style="list-style-type: none"> • Caliper with 3 LVDT sensors for displacement acquisition. • Pressure sensor to be inserted in the hydraulic circuit. • 4-input conditioner. • Acquisition card with software. 	3	€ 2,350.00	€ 7,050.00
		<p>Universal extensometer</p> <p>Consisting of 2 pieces of aluminum.</p> <p>To be placed on cylinder (from 80 mm to 160 mm).</p> <ul style="list-style-type: none"> • Adjustable length from 50 to 160 mm. • Stroke: ± 1.5 mm. • Sensitivity: 0.01 microns. • Net weight: 1 kg. <p>Delivered in a storage box and with the support of extensometers.</p>	3	€ 840.00	€ 2,520.00
		<p>Tensile dynamometer with capacity 5000 daN</p> <p>To measure the adhesion of a product on its support.</p> <p>The tensile force in daN is exerted on a chip integral with the apparatus and whose surface is known.</p> <p>Comes complete</p>	3	€ 1,250.00	€ 3,750.00
		<p>Pullout test</p> <p>The effort of extracting an insert in hardened concrete makes it possible to evaluate its resistance.</p> <p>The apparatus consists of the following elements:</p> <ul style="list-style-type: none"> • 1 hydraulic cylinder. • 1 pump with manometer of 60 kN. • 1 set of inserts to put in place during the pouring of the concrete. • Support ring. • Dimensions: 740 x 300 x 255 mm. <p>Delivered with set of 25 inserts</p>	3	€ 2,650.00	€ 7,950.00

		<p>Wearing machine for paving stones The test involves abrasion of the upper face of a test piece with an abrasive contained in a hopper. Composed of:</p> <ul style="list-style-type: none"> • Funnel with abrasive. • Abrasive disc Ø 200 mm, thickness 70 mm. • Drive system with electronic dimmer for speed control. • Counter for setting the number of revolutions of the disk. • Dimensions: 630 x 650 x 900 mm. 	3	€ 9,850.00	€ 29,550.00
		<p>Wearing machine for tiles and ceramic tiles Composed of:</p> <ul style="list-style-type: none"> • Funnel with abrasive. • Abrasive disc Ø 200 mm, thickness 10 mm. • Drive system with electronic dimmer for speed control. • Counter for setting the number of revolutions of the disk. • Dimensions: 630 x 650 x 900 mm. 	3	€ 9,850.00	€ 29,550.00
		<p>Böhme abrasion test machine Measurement of the volume lost after abrasion composed of:</p> <ul style="list-style-type: none"> • Horizontal steel disc, rotation speed 30 rpm. • Stopping in rotation after 22 turns. • Adjustable force of 294 N + - 3 N. • Power supply: 240 V 50 Hz single phase. • Dimensions: 1500 x 1000 x 850 mm. 	3	€ 11,520.00	€ 34,560.00

		<p>3000 KN capacity Compression machine for solid blocks tests</p> <p>Main Features:</p> <ul style="list-style-type: none"> • Frame with 4 columns with high rigidity. • Compression plate: 510 x 310 mm. • Distance between fixed trays 335 mm or optionally adjustable. • Power supply: 230 V 750 W single phase. <p>Operation: Manual</p>	3	€ 6,500.00	€ 19,500.00
		<p>Manual gooseneck bending machine</p> <p>For prefabricated, plate tests, interjoists, kerbs ...</p> <p>Standard tests for samples up to 200 x 200 x 800 mm.</p> <ul style="list-style-type: none"> • Cylinder upper shaft, 11 cm. • 4 adjustable supports. • Dimensions: rolls Ø 3 x 55 cm. • Passage between rolls 26 cm. • Adjustment of upper rollers from 7.5 to 18 cm. • Adjustment of lower rollers from 7.5 to 52.5 cm. • Power supply: 240 V 50 Hz single phase. • Power: 750 W. • Weight: 350 kg. • Dimensions: 1400 x 1200 x 1430 mm. 	3	€ 2,500.00	€ 7,500.00
		<p>Long life creep testing machines 1000 kN</p> <p>These machines allow long-term tests on building materials, with a typical loading of compression.</p> <p>It is possible to test one or more test specimens mounted in series.</p> <p>The loading cylinder is pressurized by a manual or motorized pump.</p> <p>The force is read on the manometer or a digital display and is kept constant thanks to a compressed gas accumulator.</p> <p>Comes with extensometers for deformation.</p>	3	€ 4,500.00	€ 13,500.00

			Machines with extra long bending table 200 kN Bending machines with 6 m long bending table, for 3- or 4-point testing on concrete beams, wood, and other materials. The swivel supports are easily adjustable on the tables graduated in mm. These, made of I-sections, give great rigidity to the structure. Double acting cylinder with anti-rotation device.	3	€ 2,560.00	€ 7,680.00
			Concrete tubes - Testing machines 1500 kN Test machines specially designed for the testing of concrete pipes and tubes up to 2000 mm in diameter and 2500 mm in length. The machines are available with mechanically adjustable upper crossbar or hydraulic cylinder with passive hydraulic clamping.	3	€ 5,230.00	€ 15,690.00
		3.8 Non-destructive tests				
			Fissurometer Recorder (Fissuro-thermo-logger) Allows you to continuously record the opening of cracks or joints. A resistive sensor with probing tip, previously programmed with a PC, acquires the relative displacement and the temperature as a function of time. At the end of each campaign, the measurements are transferred and retrieved by RS232 into a PC in the form of tables of values and graphical curves. Comes with software and accessories, and PC.	5	€ 8,380.00	€ 41,900.00
			Electronic extensometer This instrument makes it possible to precisely measure the linear variations of a structure, a concrete specimen, a brick, etc. It consists of an extensometer with a 1/1000 scale digital comparator, an INVAR test bar, 50 reference disks and a glue tube. Measuring base: 100 - 300 - 600 mm. Delivered with glue tube, set of 50 discs	5	€ 940.00	€ 4,700.00

		<p>Measuring microscope with integrated light Particularly used for measuring and locating defects, cracks, etc.:</p> <ul style="list-style-type: none"> • Magnification 40 times. • Réticule 4 mm/ 0.02. • Power supply: HP7 batteries - 1.5 V. • Supplied in a transport case. 	3	€ 3,750.00	€ 11,250.00
		<p>fissurometer Transparent plastic strip having defined width lines for measuring, by comparison, crack openings between 0.05 and 40 mm.</p> <ul style="list-style-type: none"> • Delivered with protective case. 	24	€ 45.00	€ 1,080.00
		<p>Crack gauge For measuring cracks and controlling their evolution over time. Self-adhesive gauges on smooth surfaces that can be glued or nailed to rough surfaces. The reading is done according to the principle of vernier at 1/ 10th. Measuring field 30 mm.</p>	24	€ 25.00	€ 600.00

		<p>Resistivity meter for concrete</p> <p>Fully integrated 4-point Wenner probe, designed to measure the electrical resistivity of concrete by a non-destructive method.</p> <ul style="list-style-type: none"> • Important measurement range (from 0 to about 1000 k Ω m). • Quick and accurate provision of measurement results. • Indication of current flow and low electrical contacts. • Function maintain, save and delete in built-in memory. • USB connection and dedicated PC software. • Designed to float (waterproof with IPX7 protection rating). • Quickly adjusts probe spacing. • Frequency: 40 Hz. • Memory: Non-volatile, approx. 500 measured values. • Power supply: > 50 hours of autonomy. • Charger connection: USB Type B, (5V, 100mA). • Dimensions 197 x 53 x 69.7 mm. 	3	€ 3,250.00	€ 9,750.00
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		<p>Canine Corrosimeter For detecting corrosion of reinforcement of concrete structures, before the appearance of visible damage. Corrosion of reinforcements in concrete is an electrochemical phenomenon: by measuring the surface potential of concrete, the corrosion of steels can be evaluated. The canine has one or more copper / copper sulphate electrodes coupled to a central acquisition unit (storing 120 000 measurements) that analyzes the area under examination. The device comes with:</p> <ul style="list-style-type: none"> • 1 bar electrode. • 1.5 m cable. • 25 m grounding extension. • Copper sulfate. • Carrying case. • Software for Excel® operation. • Power supply: 6 AA batteries. • Autonomy 60 hours. • RS232 output. <p>Comes in a briefcase.</p> <ul style="list-style-type: none"> • Dimensions: 320 x 285 x 105 mm. 	5	€ 1,200.00	€ 6,000.00
		<p>Standard N type Sclerometer for non-destructive testing of concrete structures according to NF EN 12504-2 and ISO 8045. To evaluate the homogeneity of a structure and measure the compressive strength of concrete from 10 to 70 Mpa</p>	24	€ 450.00	€ 10,800.00
		<p>Sclerometer with built-in NR recorder. * Watchmaking quality * For measuring the compressive strength of concrete: 10 to 70 MPa. * Graphical recording of measurements.</p>	5	€ 2,750.00	€ 13,750.00

		<p>Ultrasonic device type PUNDIT LAB For the measurement of the propagation time of ultrasonic waves in a material, Determines: > The propagation time of the wave between the two transducers > The propagation speed of the wave > The resistance of concretes > Calculation of crack depth With a Winlink type software, > Visualization and analysis of waveforms > Real-time data acquisition > Control of the device from the software Technical characteristics > Measurement range: 0.1 to 9999 μs > Display propagation time: 0.1 μs > 500 measures memory > Transfer of measurements to PC via USB > Oscilloscope outputs: 2 > Piloting using the supplied software > Delivered with 2 54 kHz transducers, 2 1.5 m cables, calibration bar , coupler, battery charger, batteries, software and carrying case</p>	3	€ 5,800.00	€ 17,400.00
		<p>Cembureau Permeabilimeter Allows measurement of the air or gas permeability of concrete elements or other porous materials, through a concrete disc. The apparatus comprises: • A pressure cell capable of accommodating test tubes of \varnothing 150 mm - H 50 mm, weight: 17 kg. • A control panel with a pressure gauge graduated from 0 to 6 bar and 4 capillaries (1.5 - 5 - 15 and 150 ml) to measure the gas flow through the material. • Dimensions: 1,180 x 780 mm. • Weight: 21 kg. Delivered with gas bottle and regulator</p>	3	€ 2,210.00	€ 6,630.00

		<p>Concrete permeabilimeter Used to determine the water absorption of 200 x 200 x 120 mm prisms or 15 cm cubes. The test piece is held between two flanges equipped with seals. Pressurized water is applied to the surface of the specimen using a compressor. The penetration of water is evaluated at the end of the test in two ways:</p> <ul style="list-style-type: none"> • Rupture of the test sample. • Reading on graduated burettes. <p>Characteristics :</p> <ul style="list-style-type: none"> • 3 measuring cells. • Working pressure: 10 bar max. • Dimensions: 420 x 1270 x 1660 mm. • Weight: 110 kg. 	3	€ 2,300.00	€ 6,900.00
		<p>Reinforcement detector Profoscope-type Detection of reinforcement and measurement of coatings > Detection up to 185 mm deep > Measurement of the cover and the diameter of the bars > Audible and visual signals on the digital display for the localization of reinforcement (search of the direction, measurement of the cover, > Directional probe</p>	5	€ 3,100.00	€ 15,500.00
		<p>Fleximeter recorder Intended to accurately determine the measurement of flexure on bridges, beams and other suspended structures using an Invar wire. The device consists of:</p> <ul style="list-style-type: none"> • Drum recorder, height 100 mm, graduated from 0 to 20 with 1 turn rotation in 24 h, 7 d or 31 d. • Amplification 5 and 10. • Power supply: 5 V alkaline battery. • Weight: 2 kg. <p>Delivered with Invar wire: roll of 100 m of Ø 0.5 mm (resistance 15 kg).</p>	5	€ 1,580.00	€ 7,900.00

		<p>Fleximeter with direct reading Allows to accurately determine the measurement of the deflection of beams, ceilings or various structures. It consists of a large 25 mm stroke comparator with articulated support for fixing the Invar wire. Delivered with transport case and 20 m Invar wire and 3 sets of comparators 25 mm / 0.01 with accessories.</p>	5	€ 1,120.00	€ 5,600.00
	4. SOIL				
	4.1 In situ tests				
	4.1.1 Geophysical prospecting				
		<p>Ground penetrating radar (GPR) + Software + PC Delivered with :</p> <ul style="list-style-type: none"> - Control unit type SIR4000 compatible with all antennas - Dual frequency antenna 300/800 MHz model 50300/800 (0-2 / 3m) - Remote encoder trolley - 2 Batteries, Charger, AC Adapter - Robust transport case - Connectivity, GPS RS232 serial port - Mounting kit, Reinforced white antenna support tray, Li-Ion battery for control unit, Control unit carrying harness, 200 MHz radar antenna + sa Protection plate, 3 m radar antenna cable, Encoder wheel for antennas from 100 to 400 MHz, 2000 MHz radar antenna (0-40 cm) incl. 7 m antenna cable and rugged carrying case, 100 MHz monostatic radar antenna (0-15 m), 3D module for Radan type software 7, GSSI Radar Data Editing and Processing Software Version 7, Main Module 	3	€ 78,030.00	€ 234,090.00
		Complete 24-channel seismograph + software W INSISM + PC	3	€ 18,000.00	€ 54,000.00

		Resistivity meter for wells and boreholes, Kit for an investigation area of 400m depth (with distance AB = 2000m or with 1/5 dist AB max for Schlumberger VES or 2000/5 = 400m), delivered with: 1 x resistivimeter type Mod 16 GL-N, 4 x 500-300- 100m cable rolls, 5 x P100-2 accumulators, 2 x copper electrodes, 1 x 1.25kg mallet, 1 x VES data inversion software, 1 x Lap top	3	€ 13,000.00	€ 39,000.00
		Resistivimeter system type ARESII / 10 120 electrodes Complete system of electrical tomography- 120 electrodes, including: - ARESII / 10 10-channel resistivity meter, - 10 ME II / 5-5 active cables, - 124 electrodes and connectors, - 12V battery cable - transport cases - ground laptop	3	€ 69,000.00	€ 207,000.00
	4.1.2 In situ density measurement				
		Sand Densitometers: Sand cone ø 6 inches. According to ASTM D1556, AASHTO T191, CNR 22, UNE 7371 and 83109. For the measurement of in situ density of soils. Comes complete with: * bicone equipped with a valve, * 2 5 litre plastic cans, * perforated base plate.	12	€ 170.00	€ 2,040.00
		3 litre Membrane densitometer according to standard NF P94-061-2 for in-situ density measurement. - 3000 ml Cylinder, - Piston with graduated rod, - Pressure gauge, Supplied with accessories including 4 anchors and 6 reinforced membranes. weight / 10kg dimensions: 360x360x700mm	12	€ 1,100.00	€ 13,200.00

		<p>Gammadensimeter According to NF P 98 241-1 and ASTM D2922 Type Humbolt</p> <p>Allows the control of the apparent average density in place of a given thickness of material:</p> <ul style="list-style-type: none"> * Control of water content and capacity of soils, concrete, asphalt. * Surface measurement (backscatter) or depth (up to 300 mm / 50 or 25mm). 	5	€ 13,900.00	€ 69,500.00
		<p>RADIAMETER type BLEEPER SV</p> <p>The pocket battery activates radiation monitoring.</p> <ul style="list-style-type: none"> * Provides an audible indication of combined x-ray and gamma rays * It has an LCD display that shows the radiation rate in Sv <p>Technical characteristics :</p> <ul style="list-style-type: none"> * Dimensions: 16 (L) x 4 (H) x 4 (D) cm * Measuring range: 45 keV - 3 MeV 	5	€ 1,100.00	€ 5,500.00
		<p>Electrical densimeter (without radioactive source)</p> <p>The electric densimeter is a non-nuclear alternative to determine the moisture and density of compacted soils. It is battery powered and is likely to be used without any regulatory constraints associated with nuclear safety. Easy to use, the electric densimeter measures dry and wet density, water content and compactness.</p> <ul style="list-style-type: none"> • Wet density range: range of conventional compacted soils. • Dry density accuracy: less than 3%. • Range of water content: range of conventional compacted soils. • Precision water content: less than 2%. • Operating temperature: 0-50 ° C • Ambient operating humidity: 5-90%, non-condensing. • Power supply: Lithium Ion battery (optional AA battery). • Battery life: approx. 60 h. execution. • GPS: ± 3m. • Battery charger: 110-240V 50 / 60Hz. • Dimensions: 533 mm x 432 mm x 203 mm. • Weight: 7 kg. 	5	€ 6,750.00	€ 33,750.00

		Surface sampler, Set with Ø 100 mm tube and drop weight of 10 kg.	48	€ 165.00	€ 7,920.00
		<p>Electronic Compaction Controller Type Humbolt To carry out soil compaction control.</p> <ul style="list-style-type: none"> • Alternative to the plate test. • Portable device not using a radioactive source. • Displays the modulus of elasticity of the soil. <p>Main Features:</p> <ul style="list-style-type: none"> • Measurement range. - Stiffness from 3 to 70 MN / m, Young's modulus from 26.2 to 610 MPa. • Measuring principle: vibration of a load applied to the ground. • Depth of measurement 100 to 220 mm. • Duration of the test 75 seconds. • IR interface output. • Supplied with software and cable for data transmission on Hyper Terminal under Windows®. • Weight: 11 kg. 	5	€ 10,150.00	€ 50,750.00
		<p>LWD compact mechanical controller (Light Weight Deflectometer) For control of soil lift on roads and railways under construction, trenches, foundations, etc. and for the determination of the dynamic modulus of deformation between 15 and 80 MN / m2.</p> <ul style="list-style-type: none"> • Size of the plate: Ø 300 x 20 mm. • Percussion force: 7.07 kN. • Supplied complete with carrying case including digital indicator, sensor and 4 rechargeable batteries. 	5	€ 8,705.00	€ 43,525.00
	4.1.3 Plate test and deformation				
		RIB PLATE ø600MM, Cast aluminum, Equipped with two handles, Weight: 25 kg.	5	€ 750.00	€ 3,750.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		ADAPTER ø 120 MM , Centering adapter for plate ø 600 mm light alloy with 100 KN cylinder and hydropneumatic cylinder	5	€ 40.00	€ 200.00
		Extension length 200 mm light alloy to be placed under the plate for cylinders	5	€ 130.00	€ 650.00
		Extension length 100 mm light alloy to be arranged on the plate for cylinders	5	€ 80.00	€ 400.00
		100 KN MANUAL SET - Hydraulic cylinder length 330 mm, stroke 250 mm, - Manual hydraulic pump with double stage tank - analog manometer 100kN - Robust ball joint Comes with flexible, ball and calibration certificate.	5	€ 2,300.00	€ 11,500.00
		200 KN MANUAL SET Next Generation Charge App Set for Plaque Testing comprising: * A cylinder of 200 kN equipped with a ball joint at the top, * 1.8 meter HP hose * A manual hydraulic pump 2 STAGES, * A manometer of 200 kN, * A plastic transport case Supplied with calibration certificate + test plate	5	€ 2,600.00	€ 13,000.00
		BENKELMAN BEAM WITH DIGITAL COMPARATOR · Particularly intended for the measurement of deflection on pavements. · Consisting of 2 light alloy parts, 3 adjustable stabilizing feet and 1 level. · Distance between measuring end and axis of rotation: 240 cm. · Distance between axis of rotation and comparator: 120 cm. · Measure by digital comparator MT575113 supplied. · Delivered in a transport case.	5	€ 1,920.00	€ 9,600.00

		ADAPTER FOR VERIN 200 KN Adapter for alloy plate light \varnothing 600 mm with 90mm hole. Centering of 81 mm for 200KN jack.	5	€ 80.00	€ 400.00
		Trolley P / TEST PLATE Trolley for storing and transporting all the material needed to perform a plate test except for the Benkelman beam (pump, cylinder, plate, manometer, hoses, extensions) Steel tube frame dia. 25mm, 2 protection handles, inflatable tires dia. 260mm, distributed payload 300kg	5	€ 1,250.00	€ 6,250.00
		Benkelman Beam Calibration System	5	€ 550.00	€ 2,750.00
	4.1.4 Others				
		Complete equipment for CBR test on site This equipment is used to determine the lift capacity of the soil in the context of road construction on site. The set consists of: <ul style="list-style-type: none"> • 1 hydraulic cylinder of 50 kN. • 1 torque ring of 40 kN. • 1 CBR penetration piston of 100 mm length. • 1 set of extension rods: 2 x 100 mm, 1 x 300 mm, 1 x 600 mm, 1 x 1 000 mm. • 1 piston adapter to the extension rod. • 1 adapter from the torque ring to the extension rod. • 1 assembly bar with 2 tripods and 1 aluminum bar 2 meters long. • 1 comparator race 25 mm x 0.01 mm with its support. • 1 x 4.535 kg (10 lb) split overload ring. • 1 overload split ring of 9.07 kg (20 lb). • 1 round 4,535 kg (10 lb) overload ring. • 1 transport case. 	12	€ 4,250.00	€ 51,000.00

		<p>Portable scissometer For measuring direct shear strength. T-bar with torsion spring and engraved scale.</p> <ul style="list-style-type: none"> • Max scale: 0/200 kPa. • Delivered with 3 blades Ø 16 x 32, Ø 20 x 40, Ø 25,4 x 50,8 mm, an extension of 500 mm and tools. • Set provided in a carrying case. 	12	€ 3,100.00	€ 37,200.00
		<p>Scissometer - Fully electronic with digital output (Eurocode 7) Supplied with: 12 VDC Power Cable, RS-232 Communication Cable - VaneLog Recording Software (Windows), Full Scale Tool Sets (50 x 110 mm, 65 x 130 mm) , 80 x 172 mm), protective shoe, limited friction coupler and spring for raising rods, reset key with force indicator to check the vane, Tube for inner rods (42/24 x 1000 mm), inner rod (22 x 1000 mm)</p>	5	€ 16,280.00	€ 81,400.00
		<p>Clegg type compactometer Especially interesting for:</p> <ul style="list-style-type: none"> • Study of coatings. • Control of compaction. • Trench filling. • Also gives an excellent correlation with the results of the CBR test. <p>It consists of a 4.5 kg mold connected to an accelerometer that transmits an electrical pulse to a digital display.</p> <ul style="list-style-type: none"> • Dimensions: 190 x 190 x 750 mm. • Weight: 9 kg. 	5	€ 2,560.00	€ 12,800.00
		<p>Dutch type static penetrometer To determine resistance to soil penetration (lift capacity). Use by one person up to 3 m deep. The device is delivered with: 4 cones of 1, 2, 31/3 and 5 cm², set of 5 extension rods of 50 cm, pressure gauge 1000N / cm², transport case, Edelman Ø 5 cm auger and accessories.</p>	5	€ 3,100.00	€ 15,500.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		<p>Proctor Penetrometer For the control of the compactness of a soil in situ, sinks of 10 cm in steps of 1 cm. Maximum driving force 40 kg. • Supplied in a transport case with 7 standard needles Ø 6.45 - 9.08 - 12.83 - 16.53 - 20.21 - 24.80 - 28.55 mm. • Weight: 3.5 kg.</p>	5	€ 2,180.00	€ 10,900.00
		<p>Light dynamic penetrometer (10 kg ram). Set delivered in a transport case including the following materials: 1 penetrometer 10 kg, 1 manual extractor, 1 jaw lock, 12 rods dia. 22 mm (graduated every 10 cm), 12 M16 studs, 2 wrench, 2 fixed point 5 cm², 2 fixed point 10 cm², 2 M16 head</p>	5	€ 1,740.00	€ 8,700.00
		<p>Light dynamic penetrometer (8 kg ram). Set delivered in a transport case including the following materials: 1 8 kg penetrometer, 1 manual extractor, 1 jaw lock, 6 dia. 22 mm (graduated every 10 cm), 6 M16 studs, 2 wrenches, 2 fixed point 5 cm², 2 fixed point 10 cm², 2 M16 head</p>	5	€ 1,635.60	€ 8,178.00
		<p>10 Ton Static Penetrator for CPT Test and CPTU Test for 25 m depth probing, equipped with a gasoline engine, with data acquisition system, and accessories for seismic, lap top and software measurements</p>	3	€ 86,000.00	€ 258,000.00

	<p>Medium dynamometric penetrometer driven by a Honda type 4-stroke gasoline engine (1.9 kW) with folding mast and wheelset. Complete with a fixed ram of 10 kg, 2 additional rams of 20 kg and 1 ram of 13.5 kg, percussion counter, winch, threshing head, 3 support plates, set of tools. H (folded) = 1200 mm, H (erect) = 2600 mm. Fall height 0.50 and 0.75 m. Adjustable from 15 to 25 percussions per minute. Delivered with :</p> <ul style="list-style-type: none"> - Honda gasoline engine, reserve -6 Threshing heads (brass) for 32 mm drill pipe, -4 27 mm flat wrenches - Reinforced wye for 32 mm drill rods, -2 M8 Allen key for M16, M20 and M22 studs, -25 Sounding rods for dynamic penetrometer (32 x 1000 mm), -25 M20 x 60 studs for 32 mm drill pipe, -6 Fixed conical tips made of hardened steel - 10 cm² connection M20, -6 fixed conical tips made of hardened steel - 15 cm² connection M20, -Set of 4 Samplers with fixed window, M20, L = 1000 mm, OD = 40 mm, 50 mm, 60 mm and 80 mm -Manual extractor 60 kN with 2 rods for drill rods up to 85 mm, Reinforced wooden reaction board with steel profiles and plate, Clamping bowl with 2 handles, Corner set (hardened) for drill pipe from 32 to 36 mm 	5	€ 18,600.00	€ 93,000.00
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		<p>Geotechnical sounder mounted on self propelled track for full depth geotechnical reconnaissance (Auger: 40 m in Ø 100 mm, coring: 90 m in Ø 116 mm). Equipped with 4 double- acting cylinder stabilizing hydraulic cylinders, equipped with a safety non-return valve. Drilling rig of 3.50 m, useful stroke of 2.40 m liftable by hydraulic cylinder Rotating head: 2 hydraulic motors type Danfoss OMT 160 with speed change by hydraulic accumulation, maximum rotation speed = 280 rpm for coring, maximum torque = 0 to 180 mkg, manual head erase for handling or SPT Air / water injection drum on the rotation motor, right male output 2" 3/8 reg, Traction force: 2700 kg - Thrust: 2000 kg Hydraulic pump flanged on the engine, hydraulic oil cooling mounted on the pump, pressure gauges for thrust, torque and injection pressure, adjustment by pressure regulators and proportional valves, wired remote control with stop emergency and control panel commands Dimensions (work) lg 2470 x width 1100 x height 3500 mm Delivered with :</p> <ul style="list-style-type: none"> - Triplex injection pump with hydraulic motor - 80 l / min - 40 bar - Single rod brake - passage 170 - Stem tray - 500 kg capacity winch with stem and pulley - Hydraulic capstan - Semi-automatic SPT threshing - Complete 2" SPT core sampler - 2 TOOLS AND MAINTENANCE PARTS - 60 Cr (Ø 60mm) drill pipe set for 45m - Core drilling set T6 Ø 116 mm - 131 metric tubing assembly - 119 x 128 mm - TRANSPORT TRAILER set 	3	€ 105,000.00	€ 315,000.00
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		<p>STANDARD MENARD PRESIOMETER CPV 0X25 0X100 BARS FR / GB Delivered with :</p> <ul style="list-style-type: none"> - DATA ACQUISITION SYSTEM: IN ACCORDANCE WITH NF P 94-110-1 & EN ISO 22476-4 - GPRS for Data Transfer - Graphical exploitation and representation software for geotechnical data - BASIC BATCH FOR PRESSURE TESTS WITH 60mm PROBE - BASE ON 20 METERS - 60 SPARE PARTS FOR PROBE, PIPING AND ACCESSORIES -63 LOT BASE TUBE SLOT WITH 44mm PROBE - BASE ON 20 METRES - FALSE SOIL Ø63X115X500 - 9 bar - FALSE SOIL Ø63X115X500 - 20 bar 	5	€ 35,000.00	€ 175,000.00
		Water level measuring probe, 100 m wide	12	€ 422.00	€ 5,064.00
		<p>Manual auger Ø100mm Used in soil prospecting, supplied with 1m extension and T-handle</p>	12	€ 1,650.00	€ 19,800.00
		<p>EDELMAN auger Ø100mm Manual auger suitable for all types of soil. Light, strong and efficient, very high quality, almost perfect ergonomics. Quick installation of the various elements by "bayonet" connection.</p>	12	€ 410.00	€ 4,920.00
		<p>Sampling kit In situ sampling kit of undisturbed soil samples up to 5 m deep. Set consisting mainly of an auger (handle, tool Ø 7 cm, 3 extensions of 1 m) and tube (s) piston. • Divisible piston: three piston tubes of lengths 50, 100 and 150 cm with adapted pistons.</p>	12	€ 750.00	€ 9,000.00

		<p>Motorized augers (Auger for Ø 63 mm) For small boreholes or small samples. Allows a single operator to perform these jobs safely thanks to a wick brake associated with an anti-torque bar.</p> <ul style="list-style-type: none"> • 2-stroke engine of 31 cm³. • Power: 2 hp. • Equipped with 3 auger tools of 1 m, diameter 63 mm (for drilling intended for pressuremeter testing). • Weight: 10 kg. <p>Delivered with Attack Tool, 1m extension and adapter fitting</p>	5	€ 2,380.00	€ 11,900.00
		<p>Guelph type Infiltrometer Allows simple and fast measurement of the ground in situ permeability. After making a Ø 6 cm hole to a maximum depth of 80 cm, the permeameter is installed and the evolution of the water level in the tank of the previously filled instrument is measured. It's made of:</p> <ul style="list-style-type: none"> • Apparatus with strainer tube, volume meter, constant level device and tripod. • Plastic tank with manual vacuum pump. • Ø 60 mm auger with accessories. • Transport case. 	5	€ 9,850.00	€ 49,250.00
		<p>Video inspection For sewer pipes, wells and boreholes. Portable device for vertical and horizontal holes. Main Features:</p> <ul style="list-style-type: none"> • IP 68 f 36 mm stainless steel probe with color camera and integrated lighting. • 50 m fiberglass semi-rigid cable. • Image control on 5.6"color LCD screen. • 12 V rechargeable battery power supply • Video output for VCR or image analysis. 	5	€ 5,420.00	€ 27,100.00
		<p>Color table 196-color binder in 7 cards 2 additional cards for tropical soils</p>	5	€ 350.00	€ 1,750.00

		Analyses chimiques Coffret pour mesures d'acidité Coffret pour analyses de chlorure Coffret pour mesures de dureté de l'eau Coffret pour analyses de PH. nitrates, ammoniaque, ... dans l'eau	5	€ 1,440.00	€ 7,200.00
	4.2 Identification of soils				€ 0.00
		Chemical analyses Box for acidity measurements Box for chloride analyses Box for water hardness measurements Box for PH analyses. nitrates, ammonia, ... in the water	12	€ 250.00	€ 3,000.00
		SMOOTH CUP ACCORDING TO MFN 94-051	12	€ 40.00	€ 480.00
		Rough cup according to NF P 94 051	12	€ 40.00	€ 480.00
		Casagrande grooving tool with integrated wedge of 10 mm according to NF P 94-051 / ASTM	12	€ 35.00	€ 420.00
		140 mm stainless steel flexible spatula Overall length: 28 cm	12	€ 12.00	€ 144.00
		Universal blade	12	€ 23.00	€ 276.00
		400 x 400 mm Marble plate Atterberg limits.	12	€ 265.00	€ 3,180.00
		ORGANIC MATERIALS Necessary for the detection of organic matter in aggregates. Colorimetric method according to standard NF P 18-586. Set of equipment including: Test tube, Vial, Beakers, Gravity filtration set, Pipettes, Test tubes.	12	€ 470.00	€ 5,640.00

		<p>Complete device for plasticity limit The apparatus comprises:</p> <ul style="list-style-type: none"> • 1 measuring plate 300 x 300 mm. • 1 standard gauge Ø 3 mm. • 1 porcelain capsule. • 6 weighs aluminum filters. <p>Comes in a plastic case.</p>	12	€ 850.00	€ 10,200.00
		<p>Complete Device for Withdrawal Limit The apparatus comprises:</p> <ul style="list-style-type: none"> • 1 plate with 3 points. • 1 crystallizer Ø 57 mm. • 1 25 ml test tube with petri dish and flexible spatula. <p>Comes in a plastic case.</p>	12	€ 750.00	€ 9,000.00
		<p>Cone penetrometer + accessory For the determination of the liquidity limit. Manual:</p> <ul style="list-style-type: none"> • With micrometric descent of the cone. • Cone with bucket. • Dimensions: 280 x 230 x 530 mm. • Weight: 13 kg. 	12	€ 920.00	€ 11,040.00
		<p>Cone Penetrometer + Accessory For the determination of the liquid limit. Automatic</p> <ul style="list-style-type: none"> • Automatic zeroing. • Micrometric descent of the cone. • Control box with automatic release and cone lock after 5 s. • Power supply: 230 V 50 Hz. • Dimensions: 280 x 230 x 530 mm. • Weight: 15 kg. 	12	€ 2,100.00	€ 25,200.00

		Sedimentometry Comprising: 0.995 - 1.035 densimeter, 6 standard test specimens of 1000 ml, 600 x 300 x 380 mm tray, Heating stirrer with thermostat and thermometer 220 V 50 Hz -1000 W, Pyrex beaker 250 ml, Sodium hexametaphosphate 10 kg, Agitator mechanical 10 000 rpm. with stainless steel container	12	€ 1,350.00	€ 16,200.00
	4.3 Proctor CBR tests				
		Universal Extractor Designed for the extraction of specimens with diameters of 4 ", 6" 100 and 150 mm as well as CBR, Proctor and Marshall specimens. Consisting of a 50 kN hydraulic cylinder with accessories. • Dimensions: Ø 300 x 500 mm.	5	€ 650.00	€ 3,250.00
		Modified Proctor mold According to ASTM D588-559-1557 / NF P94-94 078 Diameter 6 "(Ø 152.4 x 116.4)	48	€ 100.00	€ 4,800.00
		Split CBR mold in cadmium steel according to NF P94-093 comprising: * Perforated base plate; * Mold body dia. 152.4 mm x Height 152.4 mm; * Filling increase	48	€ 180.00	€ 8,640.00
		Mechanical dial indicator - 0.01 mm reading - 10 mm stroke Without rear leg	48	€ 20.00	€ 960.00
		Scoring rule according to NF P 94-093 Length x Width x Thickness: 300 x 30 x 5mm, bevelled edges 30 °	24	€ 20.00	€ 480.00
		Soaking tray 600 x 400 x 40 0 mm	12	€ 520.00	€ 6,240.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		Modified Proctor compaction hammer made of cadmium steel according to NF P 94-093. * Compaction mass: 4.535 kg; * Fall height: 457 mm; * Diameter of the ram: 51 m.	12	€ 110.00	€ 1,320.00
		Standard Proctor compaction hammer made of cadmium steel *Compaction weight: 2,490 kg	12	€ 110.00	€ 1,320.00
		Spacer disc according to AFNOR Dia. 151.0 x 36 mm with handle	48	€ 60.00	€ 2,880.00
		2.3 kg split overload ring	48	€ 35.00	€ 1,680.00
		2.3 kg round overload ring	48	€ 45.00	€ 2,160.00
		COMPARATOR SUPPORT	48	€ 35.00	€ 1,680.00
		Stainless steel cup, diameter 240 mm	12	€ 55.00	€ 660.00
		Proctor CBR full automatic compactor + accessory Range of automatic compactors for greater uniformity and compactness. A separate electronic control panel controlled by microprocessor, allows to select the desired standard. Interchangeable treated steel hammer. Available in EN 13286-2 versions with the corresponding set of markers, • Power supply: 230 V 50 Hz 500 W. • Dimensions: 610 x 470 x 1710 mm.	10	€ 1,550.00	€ 15,500.00
		Electric CBR press according to AFNOR and ASTM, automatic feed rate of 1.27 mm / min Complete with: * CBR punch * comparator with support * torque ring 50 KN * accessories. Power supply: 230V.50Hz 750 W Weight: 98 Kg Dimensions: 430 x 380 x 1180 mm	5	€ 4,300.00	€ 21,500.00

		<p>Manual 50 kN CBR press The load is applied by means of a screw jack. The charging rate is obtained with a stopwatch or a clockmeter (optional). Delivered with CBR piston and accessories.</p> <ul style="list-style-type: none"> • Dimensions: 430 x 380 x 1 180 mm. 	5	€ 1,550.00	€ 7,750.00
		<p>Marshall / CBR multi- speed computerized press With 2 feed rates 1.27 mm / min and 50.8 mm / min. Delivered with CBR piston and accessories. • Dimensions: 430 x 380 x 1,180 mm.</p>	5	€ 5,500.00	€ 27,500.00
		<p>Sets Dynamometer rings with conversion tables in kN (0.5, 1, 2, 3, 5, 10, 15, 20, 30, 50, 60, 100, 250 and 400 kN)</p>	5	€ 7,000.00	€ 35,000.00
		<p>Automatic CBR test machine with control panel</p> <ul style="list-style-type: none"> • Automatic feed rate at 1.27 mm / min. • Force measurement with 50 kN electronic force sensor. • Displacement measurement with electronic displacement sensor. • Control Display Cyber-Plus or equivalent and Proctor or CBR software allowing the memorization of the curve and the operation of the results. • Comes with PC and printer. • Weight: 98 kg. 	3	€ 6,705.00	€ 20,115.00

		<p>50kN Universal Multi-Speed Press For use in the following areas:</p> <ul style="list-style-type: none"> • Soil: CBR, simple compression test, fast triaxial test. • Pavement: Marshall, indirect traction, direct shear (Leutner). • Concrete: bending test on briquettes and ceramics. • Cement: test bending test 40 x 40 x 160 mm, compression test on cubes of 40, 50 or 70 mm, traction on mortar briquettes. • Metals, plastics, wires, ropes, textiles, papers: tensile test with maximum load of 25 kN. • Clay blocks: punching. • Rocks and stones: indirect tensile test. <p>Features:</p> <ul style="list-style-type: none"> • Maximum capacity: 50 kN. • Rate of increase in load: from 0.01 to 51 mm / minute or from 1 to 15 000 N / sec. • Piston approach speed: 51 mm / min. • Maximum stroke of the piston: 100 mm. • Mounted with 2 columns 380 mm apart. • Adjustable top rail with a maximum of 850 mm. • Display and control on integrated box allowing the connection of 4 sensors or cells of efforts. <p>Memory up to 100 tests.</p> <ul style="list-style-type: none"> • High / low end limit safety. • Supplied without sensor or accessory. • Power supply: 230 V / 1F 50 Hz 150 W. • Dimensions: 500 x 450 x 1750 mm. 	3	€ 6,700.00	€ 20,100.00
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		4.4 Consolidation of soils				
			BLADE OEDOMETER 3 Fixed BLADE Oedometer and Front Load For consolidation testing of intact or drained soils subjected to vertical loads, frame made of aluminum alloy to allow a high degree of accuracy with minimal deformation. The lever is 3-speed 9: 1; 10: 1 and 11: 1 and is equipped with an adjustable counterweight. This oedometer accepts cells up to 100cm ² . Supplied without cells, comparators, weights and assembly bench	8	€ 1,050.00	€ 8,400.00
			COMPARATOR 10 / 0.01MM Mechanical dial indicator - Reading 0.01 mm - Stroke 10 mm Without rear leg	72	€ 23.00	€ 1,656.00
			BENCH FOR AN OEDOMETER Steel bench to fix 1 oedometer. Dimensions: L = 42 cm, H = 80 cm, l on the ground = 47 cm, l at water level appliances = 38 cm.	5	€ 275.00	€ 1,375.00
			50kg WEIGHT SERIES Weight series of 50 kg including: - 4 x 10 kg. - 1 x 5 kg. - 2 x 2 kg. - 1 x 1 kg	24	€ 360.00	€ 8,640.00
			Fixed ring oedometric cell, dia 71.40 mm. Surface 40 cm ²	12	€ 298.00	€ 3,576.00
			Fixed ring permeability cell. Dia.71,40 mm. Surface 40 cm ²	12	€ 438.00	€ 5,256.00
			Oedometric cell with fixed ring Dia. 112.80 mm. Surface 100 cm ²	12	€ 481.00	€ 5,772.00
			Fixed ring permeability cell. Dia. 112.80 mm Surface 100 cm ²	12	€ 809.00	€ 9,708.00

		Digitalized scanner with displacement sensor Equipped with an electronic displacement sensor for data transfer and exploitation on a datalogger.	5	€ 2,500.00	€ 12,500.00
		8-channel acquisition unit for oedometer With possibility of receiving from 16 up to 128 different signals. 32-bit microprocessor managed package. Simultaneous real-time display of up to 8 channels on 320 x 240 mm high definition LCD screen. With 3 V, 5 V and 10 VDC outputs for auxiliary sensors. <ul style="list-style-type: none"> • Power supply: 220 V 50 Hz. • Dimensions: 460 x 540 x 350 mm. 	3	€ 5,700.00	€ 17,100.00
		Automated High-pressure pneumatics oedometer, an automated application of the load by integrated pneumatic cylinder regulated air pressure. Measurement of deformation by electronic displacement sensor (supplied). Transfer of data to PC using the supplied software. Local indication on 320 x 240 mm high definition LCD screen. <ul style="list-style-type: none"> • Two scales of measurement: 0 -1,499 and 1,500 - 15,000 Newton. • Resolution: 1 Newton • Maximum load: 15 KN with air supply of 8 Bar. • Power supply: 230 V 50 Hz. • Dimensions: 240 x 370 x 450 mm. Delivered complete with PC and acquisition software, displacement sensors, cells for oedometer (Normal to fixed ring allowing the saturation of the sample and integrating the cutting kit thus preserving the characteristics of the sample, and of permeability, with burette and connection connector), Compressor (Supplied complete with filter, 50 litre tank, Pressure: 10 bar, Power supply: 230 V 50 Hz),	3	€ 7,840.00	€ 23,520.00
	4.5 Direct and / or				

		alternating shear				
			<p>Microprocessor controlled shearing apparatus with digital reading of the selected parameters.</p> <ul style="list-style-type: none"> • Adjustable speed without discontinuity from 0.0001 to 3 mm / min. • Programmable cycle with different advance and return velocities . • Power supply: 220 V single phase. Delivered with box and kit, with: • Torque ring of 2 or 3 kN. • 2 comparators. • Gear reduction device 10: 1. • Weight set of 50 kg. • Dimensions: 1,200 x 550 x 1,100 mm. • Weight: 150 kg. 	5	€ 2,200.00	€ 11,000.00
			<p>Automatic shearing machine with data acquisition and processing system + accessories</p> <p>Microprocessor controlled with digital readout of selected parameters.</p> <ul style="list-style-type: none"> • Adjustable speed without discontinuity from 0.0001 to 3 mm / min. • Programmable cycle with different feed and return speeds. • Power supply: 220 V mono. <p>Delivered with box, set of round and square specimens (50 mm, 60 mm, 100 mm, 60 mm x 60 mm, 100 mm x 100 mm) and kit, with:</p> <ul style="list-style-type: none"> • Force sensor 3 kN. • Vertical displacement sensor 10 mm. • Horizontal displacement sensor 25 mm. • System and basic software for data acquisition and processing. • Weight play of 50 kg. • 10: 1 gear reduction device. • Dimensions: 1,200 x 550 x 1,100 mm. • Weight: 150 kg. 	3	€ 9,200.00	€ 27,600.00
			<p>Manual turret cutter + accessories</p> <p>Comes with Saw, blade, tray sets</p>	3	€ 570.00	€ 1,710.00

		<p>Hydraulic cylinder extractor Suitable for quick and continuous removal of samples from Ø 35 to 101.6 mm. Max. : 900 mm. Hydraulic pumping unit with flow control to adjust the speed of the cylinder. Max. Force: 70 kN. Supplied with accessories for demolding samples of Ø 38, 85 and 100 mm. Metal chassis mounted on wheels.</p> <ul style="list-style-type: none"> • Power supply: 220 V 50 Hz 1300 W. • Dimensions: 2,741 x 635 x 1,200 mm. • Weight: 160 kg. 	3	€ 1,230.00	€ 3,690.00
	4.6 Soil permeability				€ 0.00
		<p>Compaction Permeameter (set of 4 permeameters) For the determination of the water permeability of soil samples (clay, sand, gravel, etc.). Comprising:</p> <ul style="list-style-type: none"> • 2 Cadmium steel mold bodies (inner Ø 101.6 and 152.4 mm) • 2 top baseplate with water inlet and faucet. • 2 bottom base plate with water outlet. • 4 perforated discs with stainless steel mesh 0.08 mm. 	5	€ 650.00	€ 3,250.00
		<p>Permeameter holder Allows testing at constant load or variable load, simultaneously on 4 permeameters (to be ordered separately).</p> <ul style="list-style-type: none"> • Supplied with graduated tank, fittings, tubing and burettes. • Dimensions: 1050 x 900 x 2000/3 850 mm. • Weight: 75 kg. 	5	€ 950.00	€ 4,750.00

		<p>13 L capacity Shear mixing machine for soils. Particularly used for the preparation of clay test specimens. Extremely robust, all stainless steel.</p> <ul style="list-style-type: none"> • Capacity 13 litres. • Cutter with horizontal shaft and rotating bowl guaranteeing perfect homogenization. • Stop punching. • 2 speeds. • Power supply: 380 V tri. • Power: 2,800 W. • Dimensions: 815 x 590 x 500 mm. 	3	€ 1,350.00	€ 4,050.00
	4.7 Triaxial tests				
		<p>SEMI AUTOMATIC TRIAXIAL TEST BENCH 3 CELLS Automatic measurement for 3 cells, suitable for testing:</p> <ul style="list-style-type: none"> * Not Consolidated Not Drained (UU) * Consolidated Not Drained (CU + U) * Consolidated Drained (CD) <p>The set includes:</p> <ul style="list-style-type: none"> - A control console - Software type Triaxlab-Connect - Software type Triaxlab-Reports - A computer - 50 KN compression machine - Measuring equipment for 3 cells - 3 cells up to Ø70 mm - Fittings and screws for 3 cells - Material and tools for Ø50mm specimens - A 10 bar laboratory air compressor - A printer 	2	€ 85,000.00	€ 170,000.00

		5. Rock				
			<p>Rock Sclerometer type L Similar to the N concrete sclerometer but with a percussion energy 3 times lower. Particularly suitable for shock-sensitive components and thin-walled parts.</p> <ul style="list-style-type: none"> • Measurement range: 10 to 70 MPa. • Weight: 1.5 kg. 	12	€ 2,500.00	€ 30,000.00
			Support for sclerometer and sample specimen	12	€ 650.00	€ 7,800.00
			<p>Portable Saw For cutting samples.</p> <ul style="list-style-type: none"> • Max. Blade Ø 350 mm. • Rotation speed: 3,900 rpm. • Power supply: 230 V 2 000 W. • Fixing device supplied. • Dimensions: 560 x 460 x 390 mm. Delivered with 3 diamond blades Ø 350 mm	5	€ 3,100.00	€ 15,500.00
			<p>"Point load tester" conical punch test machine For the in situ or laboratory determination of the resistance of a drill with a maximum diameter of 101.6 mm. (4 ") according to the formula P / D^2</p> <ul style="list-style-type: none"> • P = force in kN • D = Distance between the punches With graduated scale indicating the distance between points and digital pressure gauge 0/56 kN, resolution 0.001 kN and precision 1%. 55KN manual control cylinder. Delivered in wooden case with accessories and protective mask.	5	€ 2,650.00	€ 13,250.00

		<p>Ultrasonic device For non-destructive testing of materials. Case with digital display of measurements (propagation time of the wave, speed). Range of measurements:</p> <ul style="list-style-type: none"> • Propagation time: 0.1 to 9999 μs to \pm 0.1 μs. • Three excitation energies: 125 v, 250 v, 500 v and auto. • Bandwidth 20 to 500 KHz. • No gain selectable: 1x, 10x, 100x, auto. • Batteries: 4 x AA or rechargeable. • Power supply via USb (no AC outlet). • Rated power: 3.6 to 6 V olts. • Operating temperature: -10 ° C to 60 ° c. <p>The equipment includes: Case with oscilloscope and RS 232C outputs, batteries, case, 2 54 kHz transducers, 2 1.5 m cables, 25 μs calibration bar, a battery charger with USB cable, 4 x AA (LR) batteries, support data with software, transport case and contact product. Possibility to connect probes ranging from 24 kHz to 500 kHz and exponential probes.</p> <ul style="list-style-type: none"> • Dimensions: 172 x 55 x 220 mm. 	5	€ 9,550.00	€ 47,750.00
		<p>Automatic agitator Used to determine the specific weight of the soil. Rotation of two gas containers to approx. 50 rpm to meet the standard. The agitator is equipped with a friction device according to the EC safety directive.</p> <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz 150 W 1ph. • Dimensions: 550 x 430 x 500 mm. • Weight: 20 kg. 	5	€ 1,420.00	€ 7,100.00

		<p>Waterproof durability device This equipment was developed to assess the rock's durability against decay and decay when subjected to the simulated effects of climate extinction.</p> <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz 250 W 1ph. • Dimensions: 350 x 740 x 300 mm approx. • Weight: approx. 	5	€ 2,560.00	€ 12,800.00
		<p>Complete apparatus for permeability measurement of rocks with constant load with Hoek cell Comprising: Constant pressure system (pressure adjustment from 0 to 3500 kPa, Power supply: 230 V 50 Hz, Weight: 20 kg), Burette 50 ml / div 0.1ml (Supplied with stand.)</p>	5	€ 6,580.00	€ 32,900.00
		<p>Complete apparatus for resistance measurement of rocks subjected to a triaxial test with Hoek cell Allows triaxial tests on rocks. Consisting of a cell body for use up to 70 Mpa, 2 self-sealing connections for the connection of a hydraulic pump equipped with a pressure gauge for constant pressurization. The axial load is exerted with a compression machine by means of a ball joint to avoid any eccentricity. Delivered with Complete set of Hoek Cells with permeability cover, strain gauge, extensometry bridge (with 6 measuring channels), hydraulic pump (for pressure maintenance), compression machine</p>	3	€ 6,550.00	€ 19,650.00
		<p>Shearing device + accessories, delivered with set of 4 comparators</p>	3	€ 7,800.00	€ 23,400.00

		6. Metals and wood				
			<p>Universal hardness machine dedicated to use in the laboratory Rockwell Essays, Superficial Rockwell, Brinell, Vickers, Knoop.</p> <ul style="list-style-type: none"> • Tests by depth: Brinell, Vickers and Bille. • Digital display of hardness value and print, and display on a 15" LCD touch screen. • Motorized optical zoom (Magnification from X0.7 to X1000). • 5 MegaPixels High Resolution Camera. • Reading of the automatic print by image analysis or manually. • Load ranges from 0.5 to 250 kg, from 3 to 750 kg or from 10 to 3000 kg. • Load application by force cell. • Motorized turret with 6 positions (3 penetrators and 3 objectives). • Manual or motorized X-Y table. • Direct lighting system or annular LED lighting. • Maximum height of tests: 450 mm. • Maximum depth: 220 mm. • Integrated statistics, memory 10000 values. • Data recovery via USB2 or COM port. • Dimensions: 1400 x 420 x 640 mm. 	3	€ 15,200.00	€ 45,600.00

		<p>Portable Rebound Durometer (Leeb) Ideal for all metals and perfectly suited for on-site inspections of large and heavy parts. Convenient for hard-to-reach areas or confined control sites. Easy and fast to use. Large, backlit display of hardness on all scales (HL, HV, HB, HRC, HRB, HS, Rm).</p> <ul style="list-style-type: none"> • Accuracy +/- 4HL (Leeb hardness). • Duretemaximal: 72 HRC. • LCD screen. • Memory up to 100,000 values. • Data transfer to PC via USB, Ethernet or COM port. • Equolink software for data studies and update. • Autonomy of 10h. • Dimensions: 170 x 200 x 45 mm. • Weight: 900g. 	3	€ 4,800.00	€ 14,400.00
		<p>Analog shore durometer</p> <ul style="list-style-type: none"> • Available test method: Shore A and Shore D. • Materials: (hard rubber, hard synthetic materials, thermoplastics, densified wood). • Measuring range: 0-100. 	3	€ 1,120.00	€ 3,360.00

		<p>Automatic hydraulic hot coating presses For metallographic samples, compact, secure and easy to use.</p> <ul style="list-style-type: none"> • Coating machine with single or double coating chamber. • Coater automatically controlled by microprocessor. • Temperature control up to 190 ° C. • Water cooling (fast or slow). • Coating pressure up to 300 bar. • Mold diameter 25 to 50 mm. • 5.7 inch LCD screen. • 25 memorizable programs. • Audible alarm. • Power supply: 230 V 50 Hz single phase. • Dimensions: 360 x 560 x 470 mm. • Weight: 38 kg. 	3	€ 7,520.00	€ 22,560.00
		<p>Universal single screw testing machines Working in tension or in compression alike, this range covers capacities ranging from 3 to 300 kN. These particularly robust machines are ideal for all types of high speed repetitive tests. Note: Electro-mechanical machines can be considered as maintenance-free.</p>	3	€ 6,540.00	€ 19,620.00
		<p>1200KN Capacity Hydraulic universal machines dedicated to laboratory use Working equally well in tension or compression, these complete and varied ranges cover capacities ranging from 100 to 1200 kN. The setting in motion is ensured by a high pressure hydraulic group which also actuates the jaws. The movement speed of the cylinder is regulated in a loop via a servo valve. These machines' large inertias are ideal for testing metal samples strong sections with high breaking energy such as prismatic pulls, bars of concrete etc.</p>	3	€ 17,500.00	€ 52,500.00

		<p>Dynamic universal test systems Hydraulic or hydraulic cylinder traverse with passive clamping, T-slot available. Ideal for dynamic tests, fatigue, crack propagation, LCF and TMF, and statics, traction, compression, bending, on plastics, aluminum, steel, elastomer components and constituents. With torsion unit for biaxial tensile-compression torsion tests.</p>	3	€ 15,840.00	€ 47,520.00
		<p>Vibrophores Also called electromagnetic resonators these devices are Extremely efficient tools to drive fatigue tests (Wöhler curve, etc.) in the best possible economic conditions on all "hard" materials (with their own resonance frequency). Through a system of counterweights and electromagnets this resonance frequency can be adjusted (up to 300 Hz). A tensioning device generates the stress. Piloting and data acquisition is entrusted to a PC on which the operating system is installed. 700 kN capacity.</p>	3	€ 7,800.00	€ 23,400.00
		<p>Charpy type pendulum rammer and/ or Izod for Resilience Tests These machines are used to determine the breaking energy of materials (resilience). Fully boxed to meet the latest developments in EC directives, the level of safety of these machines is very high. They are available in capacities ranging from 25 to 750 Joules. The latest developments in acquisition electronics make it possible to connect them to PCs in order to record and directly process both the raw values and the results. Hammers can optionally be instrumented (acquisition of a value forcibly moment of shock).</p>	3	€ 4,680.00	€ 14,040.00

		<p>Heat treatment furnaces + accessories</p> <p>Heat treatment furnaces suitable for all types of metals and materials intended for laboratory use.</p> <ul style="list-style-type: none"> • Ceramic heating plates with integrated resistances, protected against projections and gas exhausts. • Easy to change plates. • High strength, toughened fibrous vacuum module. • Stainless steel shell with structured surface. • Double walled housing for low outside temperatures and high stability. • Adjustable opening of the air inlet in the door. • Evacuation of air in the rear wall of the oven. • Silent electronic relay. • Regulator (ramp programming, setpoint temperature and hold time). • Three-phase connection. 	3	€ 9,520.00	€ 28,560.00
		<p>Inverted trinocular microscope + accessories</p> <p>This microscope is ideal for the study of metals, and allows to control the surface conditions and analyze in detail the metals.</p> <ul style="list-style-type: none"> • Trinocular inverted stereomicroscope (option: adding camera). • Zoom: 100x - 1000x. • Objectives: 10x / 0.25, 25x / 0.40, 40x / 0.65, 100x / 0.25. • Eyepieces: WF10x (field ø16 mm). • Platine: 200 x 152mm movement 15 x 15 mm. • Sharpness: coaxial stroke and graduated fine adjustment 2 microns per division. • Lighting: adjustable 6 V 20 W halogen lamp. • Protective cover. • Dimensions: 540 x 195 x 320 mm. • Weight: 9 kg. 	3	€ 8,100.00	€ 24,300.00

		<p>Micrometers with large gooseneck + accessories Micrometers with large gooseneck to measure thicknesses of different materials (metal, plastic, rubber, cardboard, paper,) even far from the edge. The apparatus includes:</p> <ul style="list-style-type: none"> • Micrometer with digital or needle comparator. • Measuring range: 0 to 5 or 0 to 10 or 0 to 20 or 0 to 30 or, 0 to 50 mm. • Measurement resolution: 0.1 to 0.001 mm. • Depth of the gooseneck: 50, 100, 200, 300 or 400 mm. • Delivered with a set of 2 keys from the following diameters: Ø 30, Ø 20, Ø 10, or Ø 5. 	3	€ 650.00	€ 1,950.00
		<p>Wall thickness gauge with integrated memory (All materials) + accessories Used to measure parallel metal walls in Steel, Iron, Aluminum, Copper, Zinc, Bronze, Titanium, but also in Technical ceramics, Plastic, Glass, .. The apparatus comprises:</p> <ul style="list-style-type: none"> • Measurement box with 4-digit LCD digital display. • Standard 90 ° probe with 5 MHz frequency Ø 10 mm. • Measuring range: 1.2 to 225 mm in steel. • Measurement on tubes of diameter > 20mm and thickness > 3mm. • Simple zero calibration on steel wedge integrated in the keyboard. • Ultrasonic speed: 1000 - 9999 m / s. • Memorization of 5 ultrasound speeds. • Memorize the last measurement. • Power supply 2 AA batteries. • 250 hours autonomy. • Temperature of the part to be measured: -10 to 60 ° C. • Dimensions: 126 x 68 x 23 mm. • Weight: 250 g. 	3	€ 2,850.00	€ 8,550.00

		<p>Thickness gauge coatings on metal substrates with external probe Used to measure coatings:</p> <ul style="list-style-type: none"> • Non magnetic (paint, enamel, chromium, zinc, copper, galvanization, nonmagnetic stainless steel, nonmagnetic nickel chemical ...) on ferromagnetic substrates (steels, iron). • Insulation (paint, varnish, enamel ...) or nonferrous conductive metals (aluminum, zinc, brass, copper, non-magnetic special steels ...). <p>The equipment includes:</p> <ul style="list-style-type: none"> • Choice of probe: - Fe 2 mm standard probe. <p>Measuring range: 0 to 2 mm on steel substrates.</p> <ul style="list-style-type: none"> - Standard probe NFe 2 mm. <p>Measuring range: 0 to 2 mm on non-ferrous metals.</p> <ul style="list-style-type: none"> - Combined probe Fe / NFe 2 mm. <p>Measuring range: 0 to 2 mm on steel and non-ferrous metals.</p> <p>Resolution: 0.1 μm from 0 to 99.9 μm. 1 μm from 100 to 999 μm and 0.01 mm from 1 to 2 or 5 μm (depending on probe).</p> <ul style="list-style-type: none"> • Measuring box with LCD digital display. • Accuracy: $\pm 1 \mu$m $\pm 2\%$ of the measurement. • Memory of 100 measurements with statistics. • USB wireless output for exporting measurements to PC. • Minimum dimensions of the room: 20 x 20 mm². • Outside / inside bend radius: min. 5 mm / min. 30 mm. • Thickness of support: Fe: min. 0.20 mm - NFe: min. 0.05 mm. • Power supply 2 AA batteries. • Dimensions: 124 x 67 x 33 mm. • Weight: 120 g. <p>Material supplied with:</p> <ul style="list-style-type: none"> • Probe cable 1m. • Zero base in steel and / or aluminum (depending on probe). • Storage case for device and accessories. 	3	€ 2,150.00	€ 6,450.00
		300KN Universal Testing Machines for Wood Testing + Accessories,	3	€ 9,520.00	€ 28,560.00

		Machining of electromechanical testing 5500 Nm wood plates This electromechanical machine is specially designed for the determination of bentwoods in the form of 4 x 8 ft, both in the longitudinal and transverse directions in accordance with ASTM D3043 method C, pure bending test. This method is used to evaluate the effect of knots, holes, checks, oblique yarns, and plugged knots, and their effect on standard size plates.	3	€ 5,400.00	€ 16,200.00
		50KN Servohydraulic coupling pullout Specially designed system for tearing off nails, bolts and screws. The piston is equipped with sensors (0.5) for displacement and for force-displacement diagrams.	3	€ 9,840.00	€ 29,520.00
	7. Water				
		<p>Digital pH meter with microprocessor + accessories</p> <ul style="list-style-type: none"> • Measuring range 0 to 14 pH ± 0.01 pH. • Stability indicator of the measurement. To obtain accurate and reproducible results. • Automatic temperature compensation of 0-60 ° C. • Automatic calibration by recognition of 2 sets of buffers (4.01 - 7.01 - 10.01, 4.01 - 6.86 - 9.18). • Dimensions: 150 x 80 x 28 mm. • Weight: 210 g. <p>Delivered in a box with pH / ° C electrode, 1m of cable, 4 x 1.5V batteries</p>	3	€ 750.00	€ 2,250.00

		<p>Laboratory pH meter + accessories New pH meter with high performance microprocessor.</p> <ul style="list-style-type: none"> • Measuring range 0 -14 pH \pm 0.01 pH. • Temperature 0-100 ° C \pm 0.1 ° C with automatic correction. • 5 memorized buffers: 4.01 - 6.86 - 7.01 - 9.18 - 10.01 with automatic recognition system. • Control keypad with watertight keys and LCD display. • Supplied with combined glass Ph electrode, double junction, filled, BNC plug and 1m cable and temperature sensor. • Power supply: 12 V and adaptor for use on 230 V. • Weight: 1.1 kg. 	3	€ 2,510.00	€ 7,530.00
		<p>Portable Microprocessor Turbidimeter Measures the turbidity of the water and the concentration of undissolved materials.</p> <ul style="list-style-type: none"> • Measurement range: 0 to 50 FTU (NTU) / 50 to 1000 FTU (NTU). • Accuracy: \pm 0.5 FTU or 0.5% VM. • Dimension: 220 x 82 x 66 mm. • Weight: 350 g. 	3	€ 750.00	€ 2,250.00
		<p>Pocket Analyzer Measures:</p> <ul style="list-style-type: none"> • pH: 0 to 14 / 0.01 pH. • Conductivity: 0 to 20 mS / cm / 0.01 ms / cm. • The amount of dissolved solids (TDS): 0 to 10 g / L / 0.1 g / L. • The temperature: 0 to 60 ° C / 0.1 ° C. • Waterproof housing. • Battery power 4 x 1.5 V: 100 hours of operation. • Weight: 85 g. 	5	€ 650.00	€ 3,250.00

		<p>Portable digital conductivity meter For conductivity measurement with temperature compensation. This unit is particularly recommended for performing rapid conductivity measurements in the field. Measuring range: 0.0 to 199.9 μ; 0 to 1999 μ; 0 to 19.99 μ; 0 to 199.9 μ.</p> <ul style="list-style-type: none"> • Accuracy \pm 1%. • Manual or automatic compensation from 0 to 50 ° C. • Measuring probe: PVC body with steel electrode. • LCD display. • 9 V power supply. • Waterproof keyboard with sensitive keys. • Dimensions: 180 x 83 x 40 mm. • Weight: 370 g with probe. 	3	€ 1,520.00	€ 4,560.00
		<p>"Concrete mixing" water test case. Rubberized coating, aluminum angles with reinforced corners, high-density foam cushioning with specific locations for the work elements.</p> <ul style="list-style-type: none"> • Dimensions: 475 x 340 x 165 mm. • Weight: 2 kg. 	3	€ 2,540.00	€ 7,620.00

			<p>Complete Drinking water analysis kit Allows monitoring of distribution networks, groundwater, etc. Principle of the measurement: a comparison of the color of the water supplemented with a reagent in pill form. Simple and fast, the colorimetric method adapts to field and laboratory measurements. Measuring range: Total chlorine: 0.02 to 0.3 mg / L, pH: 0-14. The Complete kit includes:</p> <ul style="list-style-type: none"> • 1 comparator. • 2 bowls of 40 mm. • 3 lots of pills for 100 tests. • 2 color reference discs. Delivered in its carrying case. 	3	€ 3,100.00	€ 9,300.00
		8. Hydrocarbon binders				
		8.1 Extraction of asphalt				
			<p>Hot extractor The extraction is carried out by heating the sample.</p> <ul style="list-style-type: none"> • Supplied with hotplate. • Weight: 5 kg. 	3	€ 3,460.00	€ 10,380.00
			<p>Hot extractor Reflux Method. Supplied with hotplate.</p> <ul style="list-style-type: none"> • Weight: 9 kg capacity. 	3	€ 6,540.00	€ 19,620.00

		<p>Calcination furnace Designed to determine the binder content of asphalt without the use of chlorinated solvents.</p> <ul style="list-style-type: none"> • Terms of use: from 5 to 40 ° C, humidity <80%. • Volume: 9 L. • Max. : 1100 ° C. • Adjustable air inlet in the door. • Accuracy: ± 5 ° C. • Power: 3.0 kW. • Power supply: 230 V single phase. • Int. Dim. : 230 x 240 x 170 mm. 	3	€ 5,540.00	€ 16,620.00
		<p>Kumagaw appliance a Type LCPC For extraction of hydrocarbon mixtures: Delivered complete with balloon, vigorous refrigerant, graduated receiving tube for solvent lighter than water, brass basket, heated balloon with regulator, with 3 boxes of 25 cartridges of 80 x 200 mm.</p>	3	€ 3,540.00	€ 10,620.00
		<p>Rouen method Method for determining the bitumen content of a sample of a hydrocarbon mixture whose bitumen is not modified by additives. It does not apply to hydrocarbon mixtures containing fines or fibers less dense than the solvent.</p>	3	€ 650.00	€ 1,950.00
		<p>Large capacity mixing shaker Platform 700 x 500 mm. Suitable for 6 jars 2 or 3 litres.</p> <ul style="list-style-type: none"> • Amplitude: 70 mm. • Timer: 0 - 30 min. • Variable speed: between 40 and 80 cycles / m in. 	3	€ 950.00	€ 2,850.00

		<p>Centrifuge Particularly adapted to the Rouen method.</p> <ul style="list-style-type: none"> • Maximum acceleration at the bottom of the tube: 4,050 g at 6,000 rpm (4,000 g being the acceleration required by the standard). • Cage without coal and without maintenance. • Motor controlled by microprocessor. • Digital display of programmed speed and centrifugation time. • Very fast and adjustable braking. • Noise level <66 dB A. • Delivered with 6-place angular rotor, with reducers to accommodate up to 6 Teflon test tubes of 50 ml, sets of 6 Teflon tubes of 50 ml with reducer. • Dimensions: 261 x 366 x 437 mm. 	3	€ 4,800.00	€ 14,400.00
		<p>Continuous flow centrifuge delivered with</p> <ul style="list-style-type: none"> - 1 aluminum pot Ø 70 X 200 mm - 1 sieve Ø 200mm Open 0.063 mm - 1 sieve Ø 200mm Open 1 mm - 2 O-rings B0184 / R02 - Turning speed: 11500 rpm (automatic speed control system), - Centrifugal force: 4700 G - Capacity: 15 to 20 litres / hour 	3	€ 5,800.00	€ 17,400.00

		<p>Rotary evaporator This apparatus is used to extract the bitumen from a solvent-based coating while minimizing the influence of the extraction operation on bitumen properties. The set consists of:</p> <ul style="list-style-type: none"> • A flask of 1000 ml capacity, maintained at an angle of approximately 15 °. • Variable speed motor to keep the flange rotating at a speed of 20 to 270 rpm. • Condenser for solvent vapors. • Hot oil bath. <p>Apparatus supplied with glass tubes, three-way valve and transparent hose for introducing the solution. The rotary evaporator requires a vacuum pump with its regulator.</p> <ul style="list-style-type: none"> • Power supply: 230 V 1p 50 Hz. 	3	€ 4,850.00	€ 14,550.00
		<p>Automatic extractor of bitumens and bituminous mixtures Allows quick determination of the amount of binder present in a mixture.</p> <ul style="list-style-type: none"> • Fully automatic cycle including: sieving, centrifugation and solvent recovery. • Maximum weight of the sample by extraction: maximum 3.5 kg (400 g of filler per test). • Time required by extraction: 25 to 45 min. • Thanks to the recovery of solvents, very significant reduction in the cost of each extraction and elimination of toxic gases. • Screening unit to receive 8 sieves Ø 200 mm. • Distillation capacity of the recycling unit 40 to 50 l / h. • Power supply: 380 V 3 Ph. • Power: 5.5 kW. • Dimensions: 1400 x 680 x 1820 mm. 	3	€ 16,000.00	€ 48,000.00
	8.2 Solvent recovery				

		<p>Non-flammable solvent recuperator Completely autonomous Unit.</p> <ul style="list-style-type: none"> • Composed of 2 tanks, one for the clean solvent, the other connected to a water condenser for the used solvent. • Output flow 10 l / h. • Dimensions: 320 x 400 x 650 mm. 	3	€ 2,650.00	€ 7,950.00
		<p>Flammable solvent recuperator With explosion protection and additional protections for hot elements.</p> <ul style="list-style-type: none"> • Approx.: 40 l / h. • Control panel: 200 x 200 x 430 mm. • Power: 3.5 kW. • Power supply: 3 Ph + N + PE 50/60 Hz, 400 V. • Dimensions: 850 x 770 x 950 mm. 	3	€ 2,650.00	€ 7,950.00

		<p>Washing and drying apparatus Works with non-flammable solvents. Allows the cleaning of bitumen containers: evaporator flange, RTFOT type device or ring ball. Characteristics :</p> <ul style="list-style-type: none"> • Washing space with a basket allowing up to two flasks. • Device mounted on wheels. • In-house stainless steel manufacture. • Water cooling. • Recovery unit of 1500 W. • Heated rinse unit for fast drying. • Effective rinsing system for each flange. • Adjustable solvent heating. • Adjustable rinse time. • Automatic programs with adjustable wash and rinse time. • Connections: 25.4 mm filling, 12.5 mm flow. • Power 1.8 kW. • Power supply: 400 V, 50 Hz three-phase. • Internal dimension: 400 x 300 mm. • Device dimension: 1000 x 600 x 850 mm. 	3	€ 3,100.00	€ 9,300.00
	8.3 Sealants				
		<p>Dosing box Used to measure the aggregates dosage of a superficial coating. The equipment consists of a robust parallelepipedic box equipped with a sliding, rigid and transparent cover.</p>	12	€ 50.00	€ 600.00

		<p>Machine to shake specimens of up to Ø 250 mm for abrasion tests For 12 standard test cylinders and 6 cylinders of 250 mm diameter. Used to evaluate the water resistance of cold-poured bituminous mixes. Automatic shutdown for either a duration or a number of revolutions Internal temperature controlable from -10 to + 50 ° C. Isothermally, but also against noise. Adjustable rotation speed from 15 to 30 rpm.</p>	3	€ 550.00	€ 1,650.00
		<p>Measurement of storage stability of emulsions Equipment for measuring the storage stability by decantation of emulsions. Set comprising:</p> <ul style="list-style-type: none"> • A stand. • A clamp. • A copper tube Ø 12 mm, L: 30 cm. • A 500 ml stainless steel beaker. • A 12V stabilized power supply and its connectors. • A watch glass. 	3	€ 1,150.00	€ 3,450.00
		<p>Cohesivimeter Allows the determination of the solidification time. Consisting of a pneumatic cylinder pushing a sample and a torque wrench measuring a torque.</p>	3	€ 1,060.00	€ 3,180.00
		Global Abrasivimeter	3	€ 1,060.00	€ 3,180.00
		<p>Break index of a cationic emulsion Comprising:</p> <ul style="list-style-type: none"> • Hopper with non-adherent surface. • 2 enamelled capsules Ø 200 mm. • 200 mm nickel spatula. 	3	€ 870.00	€ 2,610.00

		<p>Vialit test Allows the determination of:</p> <ul style="list-style-type: none"> • Global adhesiveness. • Active adhesiveness between binders and aggregates. • The wettability temperature. <p>The apparatus includes:</p> <ul style="list-style-type: none"> • 10 mild steel plates. • 1 steel ball of 512 g. • Stem. • Bandage cylinder. 	3	€ 870.00	€ 2,610.00
		<p>Wide-neck glass pycnometer (set of 3 pieces of 500, 1000 and 2000 ml) For the determination of percentages of binders and aggregates in a mix when the specific weight of binders, aggregates and solvents is known.</p> <ul style="list-style-type: none"> • Wide neck Ø 45/40 mm. • Capillary tube with marking. 	3	€ 450.00	€ 1,350.00
		<p>Distillation of fluidized bitumens and fluxed bitumens The apparatus comprises:</p> <ul style="list-style-type: none"> • 500 ml distilling flask. • 250 m water cooler. • Glass fitting. • 250 ml cylindrical test tube. • Residual bitumen container. • Thermometer - 2 ° C + 400 ° C. • Electric heating. • Power supply: 230 V 50 Hz 750 W. 	3	€ 1,270.00	€ 3,810.00

		<p>Distillation apparatus for emulsions Includes:</p> <ul style="list-style-type: none"> • Alembic aluminum. • Glass connection tube. • Water condenser. • 100ml Sample. • Support. • 2 thermometers. -2 + 300 ° C. • Bunsen burner with security. 	3	€ 1,350.00	€ 4,050.00
		<p>Apparatus for determining the water content of Dean Stark emulsions Allows the determination of the water content in the bitumen by driving with the aid of a solvent. Includes:</p> <ul style="list-style-type: none"> • 500 ml glass flask. • 25 ml tube. • Support with accessories and electric heating. 	3	€ 650.00	€ 1,950.00
		<p>Manual ring ball machine For the determination of the softening point of bituminous products. Device with electronic regulators:</p> <ul style="list-style-type: none"> • Temperature. • stirring speed. • Weight: 3 kg. <p>Delivered with accessories including Pyrex beaker, shoulder rings, 2 balls and 1 thermometer -2 + 80 ° C.</p>	3	€ 450.00	€ 1,350.00

			Automatic ring ball machine for 4 samples Compatible with water, glycerol and silicone oil. New design of heating brick for a more reliable temperature rise. Microprocessor controlled temperature with automatic recording of the ring ball value of the bitumen. Ring ball value measured automatically by optical sensors. Displayed temperature measured by a PT100 sensor type and displayed on the LCD screen. Ring ball value by average of two values with precision limits. Supplied with calibration report. • Dimensions : 430 x 370 x 350 mm.	3	€ 2,350.00	€ 7,050.00
			Accessories for ring ball machines Comes in a set including: pyrex beaker, flanged rings, 2 balls and 1 thermometer -2 + 80 ° C.	3	€ 450.00	€ 1,350.00
		8.4 Penetration of bitumen				
			Automatic bitumen penetrometer For the determination of needle penetration in bituminous products. Descent of the needle by micrometer screw * Digital display of the value-resolution: 0.01 mm - LCD: 5 digits. Delivered with: * 1 needle, * 1 bucket ø 55 H 35 * 1 bucket ø 55 H 57 * Overloads for 50 and 100 g moving equipment.	3	€ 4,550.00	€ 13,650.00

		Accessory Set for Bitumen Penetrometer Includes: Numbered Needle with Calibration Certificate, Disposable Aluminum Cup. Ø55 H 35mm, stainless steel bucket Ø 55 H 57 mm, Thermometer - 8 + 32 ° C to 0.1 ° C, Thermometer + 19 + 27 ° C to 0.1 ° C	3	€ 1,550.00	€ 4,650.00
		Water bath for penetration test <ul style="list-style-type: none"> • Capacity: 10 Litres. Maintaining the temperature at + 25 ° C by electronic thermostat and cooling by water circulation of the network. • Dimensions: 375 x 335 x 420 mm. • Power supply: 230 V 50 Hz 1050 W. 	3	€ 980.00	€ 2,940.00
		Transfer tank for tests conducted outside the bath Stainless steel assembly with a coil to be connected in a water bath to maintain the specimen at 25 ° C.	3	€ 860.00	€ 2,580.00
		Glass transfer Flat bottom tray with specimen holder.	3	€ 905.00	€ 2,715.00
	8.5 Flash Point, Break Point and Viscosity				
		Open container flash point For the determination of the flash point visually with open container for volatile products. Supplied complete with container, heating system, ASTM 92 thermometer (-5 to 110 ° C) and ASTM 57C (-20 to 50 ° C). <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz 600 W. • Dimensions: 200 x 300 x 400 mm approx. 	3	€ 2,650.00	€ 7,950.00

			<p>Closed container flash point For the determination of the flash point between 0 and 80 ° C of volatile products with closed container. Supplied complete with container, heating system, ASTM 92 thermometer (-5 to 110 ° C) and ASTM 57C (-20 to 50 ° C).</p> <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz 600 W. • Dimensions: 200 x 300 x 400 mm approx. 	3	€ 3,250.00	€ 9,750.00
			<p>Pensky-Martens flash point For visual determination of the flash point between 30 and 370 ° C</p> <ul style="list-style-type: none"> • 72 ml measurement vessel. • Electronic temperature regulation and digital display. • Supplied complete with thermometer and stirring device. • Power: 600 W. 	3	€ 4,500.00	€ 13,500.00

		<p>Rheometer for bending bitumen</p> <p>The bending rheometer for bitumen makes it possible to measure the bending performance at low temperature of an asphalt binder. These tests involve applying a force to a sample immersed in a temperature-controlled bath to determine different rates of deformation as a function of temperature. The system consists of a low-temperature controlled bath, an easily removable bending unit to allow the installation of the sample, an external temperature-controlled cooler and calibration kit in its case. The unit features a stainless steel frame and integrated loading rod with rounded loading tip. The device includes ASTM / AASHTO compliant molds and complete calibration kit in its case.</p> <p>Characteristics:</p> <ul style="list-style-type: none"> • Charge: 0 to 200 g. • Accuracy per test cycle: $\pm 0.5g$. • Cycle time: defined by the operator. • Capacity of the load cell: 500 g. • Sample holder: 25 mm diameter spaced 101.6 mm apart. • Operating temperature: ambient at $-40^{\circ}C$. • Compressed air supply: dry and dust-free air, 340 kPa. 	3	€ 5,230.00	€ 15,690.00
		<p>Engler Viscometer with electric heating, complete with:</p> <ul style="list-style-type: none"> * Thermostat, * Agitator, * Cup and test needle, * One volumetric flask of 250 ml each two strokes at 100 and 200 ml * Thermometer $0-55^{\circ}C$ at $0.2^{\circ}C$, * Power supply: 22 0V - 50Hz - single phase. 	3	€ 2,140.00	€ 6,420.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		<p>Saybolt viscometer For determining the viscosity of oils. Stainless steel construction.</p> <ul style="list-style-type: none"> • Electric heating: 500 W. Supplied complete with Furol and Standard ports, thermostat, agitator, cooling coil, 60 ml Saybolt vial. • Power supply: 230 V 50 Hz. • Dimensions: 270 x 270 x 550 mm. 	3	€ 2,025.00	€ 6,075.00
		<p>BRTA-REDWOOD-STV viscometer For determination of pseudo-viscosity of bitumens.</p> <ul style="list-style-type: none"> • Stainless steel construction. • Electric heating 300 W. • Power supply: 240 V 50 Hz. • Dimensions: 270 x 270 x 550 mm. <p>Delivered complete with thermostat, 10 mm orifice, (2 mm or 4 mm optional), shutter, thermometer 0 ° C + 44 ° C.</p>	3	€ 2,340.00	€ 7,020.00
		<p>Bimetallic thermometer Metal dial Ø 50 mm Scale 0-250 ° C Division: 5 ° C Metal rod Ø 8 x 250 mm</p>	12	€ 40.00	€ 480.00
		<p>Portable Microprocessor Turbidimeter calibrated to 100ml and 200ml for ENGLER Viscometer</p>	12	€ 150.00	€ 1,800.00
		<p>Thermometer for REDWOOD STV TAR Viscometer, BRTA, Scale 0-45 ° C ± 0.2 ° C</p>	12	€ 60.00	€ 720.00

		<p>Brookfield Type Viscometer</p> <ul style="list-style-type: none"> • Digital display of test parameters and viscosity. • Accuracy $\pm 2\%$. • Range of use: 0 to 100 poises depending on the cone used. • Adjustable temperature from 50 to 235 ° C in steps of 0.1 ° C. • Rotation speed: 750 rpm • Delivered in rigid transport case with cone No. 3 (1-10 poises). • Printer output. • Power supply: 230 V - 125 W. 	3	€ 3,520.00	€ 10,560.00
		<p>Professional DIGITAL splashproof stopwatch</p> <p>Splashproof with double injection rubberized case. Three functions: - chrono at 1/100 of a second, 1/1000 of a minute and 1/10 000 of an hour and memorization of 500 cycles</p> <ul style="list-style-type: none"> -digital clock -calendar -dimensions: 8x5.7x1.9 c m -weight: 80 g <p>ise</p>	12	€ 65.00	€ 780.00
	8.6 Aging and Ductility Tests				

		<p>Determination of mass losses during heating . Used to determine the mass loss of bituminous products free of water, heated under standard conditions. Includes:</p> <ul style="list-style-type: none"> • Stainless steel drying oven with a window of 100 x 100 mm. • Temperature control via electronic regulator with digital display. • Equipped with a rotating plate with 9 cups Ø 55 x 35 mm. • Supplied with thermometer + 155 to + 170 ° C at 0.5 ° C. • Rotation speed: 5 to 6 rpm. • Power supply: 230 V 50 Hz 1,200 W. • Internal dimensions: 330 x 330 x 330 mm. • External dimensions: 460 x 450 x 700 mm. 	3	€ 4,500.00	€ 13,500.00
		<p>Measuring the combined effects of heat and air on a thin bitumen film Oven made of stainless steel with door equipped with a porthole of 320 x 215 mm. Maintaining the temperature at + 163 ° C ± 1 ° C by electronic controller with digital display. Built-in flowmeter for up to 4000 ml / min inside the oven, (supply of compressed air). Supplied with 8 x 64 x 140 mm glass vials and an ASTM 13C thermometer.</p> <ul style="list-style-type: none"> • Power supply: 230 V 50 Hz, 1300 W. • Internal dimensions: 405 x 340 x 445 mm. • External dimensions: 620 x 620 x 910 mm. 	3	€ 4,850.00	€ 14,550.00

			<p>Automatic Ductilimeter Developed specifically for ductility testing and research. Delivered with:</p> <ul style="list-style-type: none"> • A force cell of 500 N capacity, additional forces cells available • Electronic system of control and acquisition of data. • Glass lid. • With thermal regulator from +5 to 25 ° C. • Mold for test at + 25 ° C • Mold for test at + 5 ° C • Common molding plate • Power supply: 230V, 50 Hz, 1000W. • Dimensions: 2140 x 400 x 450 mm. 	3	€ 6,810.00	€ 20,430.00
		8.7 bitumen / aggregates Compatibility				
			<p>10 L Vacuum Pycnometer For the measurement of the real density of an asphalt mixture using the volumetric method. Plexiglass set supplied with valve and manometer.</p> <ul style="list-style-type: none"> • Dimensions: Ø 300 x 450 mm. 	3	€ 550.00	€ 1,650.00
			<p>Vacuum regulator with degassing valve Adjustable vacuum regulator in millibars. Features a degassing line for pressure stabilization. Outputs to the vacuum pump and vibrating table. Adjustable time for pressure rise and final vacuum value.</p> <ul style="list-style-type: none"> • Power supply: 230V, 50Hz. • 120W power. 	3	€ 2,570.00	€ 7,710.00

			<p>Determination of granular-asphalt affinity for 6 bottles Apparatus for 6 bottles. Meant to deaerate samples. For 3 bottles of 500, 1000 or 2000 ml.</p> <ul style="list-style-type: none"> • Infinitely adjustable speed. • Power supply: 230V, 50 Hz. • Power 130 W. • Dimensions: 105 x 340 x 350 mm. <p>Delivered with 500 ml, 1000ml and 2000 ml bottle + glass sticks.</p>	3	€ 2,350.00	€ 7,050.00
		8.8 Indentation and mixing tests				
			<p>Two- piece indentation tester, model with weight loading Robust steel frame, mounted on a rigid base plate. Bath and loading rod guided by ball bearings. Used to test a sample. The loading is applied without transmitting shocks to the loading rod. • Loading applied by 4 threaded pins.</p> <ul style="list-style-type: none"> • Mechanical comparator with rotating support, stroke of 30 mm and resolution of 0.01 mm. • Loading of 500 N per measuring point. • Interchangeable penetration tip. • Dimensions: 400 x 500 x 900 mm. 	3	€ 8,560.00	€ 25,680.00
			<p>Measuring system for indentation test Adapter for Installing the digital comparator. Two comparators with support, stroke of 30 mm, resolution of 0.01 mm. Indentation test software according to EN 12697-20 / 21. Two USB type cables.</p>	3	€ 1,520.00	€ 4,560.00

		<p>69 mm mold for indentation test Designed to hold the sample during the test.</p> <ul style="list-style-type: none"> • Weight: 1.4 kg. 	3	€ 450.00	€ 1,350.00
		<p>Laboratory mixers for gravel-cement For preparation of mixtures with large grain size (15 to 20 mm). 20 l Capacity Powerful mixer with optional scraper arm specially designed for coarse grains and difficult mixes.</p>	3	€ 1,580.00	€ 4,740.00
		<p>Laboratory mixers for gravel-cement For the preparation of fine granulometry mixtures. Capacity 20 l.</p> <ul style="list-style-type: none"> • Variable rotation speed. • Stainless steel tank. • Power supply: 380 V - three phase. 	3	€ 1,580.00	€ 4,740.00
		<p>Bi-rotation mixer for asphalt. Mixers for the preparation of homogeneous samples of hydrocarbon products in the laboratory.</p> <ul style="list-style-type: none"> • Electrical sampling at $200^{\circ}\text{C} \pm 5^{\circ}\text{C}$. • Archimedean screw mixing with planetary rotation. • Adjustable rotation speed between 32 and 128 rpm for planetary rotation and 105 and 420 rpm for tool rotation. Loading hatch for materials being mixed. • Tank with removable wear plate of 45 litres. • Power supply: 400 V - 50 Hz - 6 kW. • Two capacities: 25 litre tank for 5 to 15 kg of material or 45 litre tank for 15 to 30 kg of material. 	3	€ 3,350.00	€ 10,050.00

		8.9 Stability, reactivity and control of lime spreading				
			Lime reactivity test Allows the determination of the reactivity of lime with water, in the liquid phase. The equipment includes: a 1 litre Dewar vessel Ø 77 mm with cover for the passage of the thermometer and the axis of the mixing blade.	3	€ 3,540.00	€ 10,620.00
			Thermometer From -50 to +150 ° C / 0.1 ° C.	12	€ 60.00	€ 720.00
			Propeller Stirrer For adjustment at 300 rpm ± 10 with stand and clamping nuts (without blade).	3	€ 350.00	€ 1,050.00
			Mixing blade Ø 60 mm.	3	€ 250.00	€ 750.00
			Hydrated calcium silicate plates Lot of 10 absorbent plates of 100 x 100 x 6 mm. • Density ~ 1 g / cm ³ . • Absorption time ~ 10 min.	3	€ 65.00	€ 195.00
			Tarpaulin and load cell for the control of spreading of road binders and lime PVC coated polyester tarpaulin of 1 m ² with 4 eyelets.	3	€ 650.00	€ 1,950.00
			Dynamometer With digital display. • Range 50 kg / 50 g. • Digital reading. • Zinc-plated hanger.	3	€ 350.00	€ 1,050.00

		8.10 Preparation of test samples				
			Soil-cement mold For the manufacture of fine sand test specimens or soils. It consists of the following elements: Mold body Ø 50 mm (test piece H 50), mold body Ø 50 mm (test piece H 100), upper or lower piston (2 per mold), wedge set of 25 mm, wedge set of 12.5 mm, wedge set of 6 mm, Release piston, Release base (H 55), Release base (H 110)	12	€ 620.00	€ 7,440.00
			Treated mold made of medium hard steel including: Counter mold Ø int. 54.3 mm and H 150 mm, stainless steel case Ø int. 50 mm, Assembly piston Ø 49.8 mm, Set of 1/2 mould Ø 50.2 mm and H 12.5 mm, Set of 1/2 mould Ø 50.2 mm and H 6 mm, Release piston, Release base	12	€ 580.00	€ 6,960.00
		8.11 Duriez test				
			Mold for Du riez test normal Ø 80 mm and dilated 120 mm All elements are bichromated treated steel. The mold bodies have the inside rectified. Consisting of: Mold Body, Mold Release Base, Upper or Lower Piston (2 per mold), 3 Part Split Hollow Release Piston, Wedge Set	12	€ 370.00	€ 4,440.00

		<p>Climatic chamber intended for the conservation of Duriez test specimens Designed for the storage of DURIEZ test specimens at + 18 ° C ± 1 ° C and 50% RH ± 1% (homogeneity ± 2%) + 50 ° C ± 1 ° C and 50% RH ± 1% (homogeneity ± 0 , 3 ° C and 2% Hr).</p> <ul style="list-style-type: none"> • Volume 600 litres. • Temperature range: 10 to 60 ° C. • Humidity 30% to 90% depending on the temperature of use. • Inner chamber: 304 stainless steel welded continuously, ensuring perfect water and water vapor tightness. • Regulators with processor and LCD display with RS232 interface and security code. • PT100 stainless steel shatterproof 1/3 DINB probe. • High precision capacitive probe for hygrometry control. • External dimensions: WxDxH: 740 x 985 x 1980 mm. • Internal dimensions: WxDxH: 530 X 650 X 1300 mm. • Shelf dimensions: 600 x 530 mm. • Power: 2500 W - 11 A. • Maximum power dissipated in the room: 1000 W. • Power supply: 230 V 50Hz. 	3	€ 5,720.00	€ 17,160.00
	8.12 Marshall test				
		Steel Marshall Mold Body Anti-corrosion treatments.	12	€ 55.00	€ 660.00
		Marshall Anti-corrosion treatment	12	€ 90.00	€ 1,080.00
		MARSHALL BASEPLATE Base plate with handles. Treated against corrosion. Weight 3.1 kg	12	€ 85.00	€ 1,020.00
		ASTM Marshall Spacer	12	€ 65.00	€ 780.00
		DISC FILTERS Lot of 100 filter papers	12	€ 9.00	€ 108.00

			Wooden base for Marshall test	5	€ 810.00	€ 4,050.00
			Marshall compacting hammer without wooden stand	5	€ 230.00	€ 1,150.00
			Marshall hammer stand for the set	5	€ 130.00	€ 650.00
			MARSHALL electric test press for compression testing with creep measurement on Marshall test specimen. - Feed rate 50.8 mm / min - 30 kN torque ring - High and low safety devices, - Crushing jaws, - Creep measuring device,	3	€ 4,700.00	€ 14,100.00
			CRUSHING MOLD Crushing jaws for MARSHALL stability. Supplied without a device for creep measurement	3	€ 295.00	€ 885.00
			Creep measuring device	3	€ 82.00	€ 246.00
			MARSHALL COMPARATOR Comparator for creep measuring device	3	€ 35.00	€ 105.00
			MARSHALL thermostatic bath of 45 litres. Stainless steel construction for storage of up to 17 test specimens. * Adjustable temperature up to 90 ° C, * Power supply: 220 V - 50/60 Hz - Single phase * Power: 1500 W * External dimensions: 540 x 690 x 370 mm, * Internal dimensions: 615 x 505 x 150 mm	3	€ 2,110.00	€ 6,330.00
		8.13				

	Compression/ traction test				
		<p>200 kN Universal testing machine The machine is supplied complete with a force sensor of 200 kN, a displacement sensor, a software for Duriez, Marshall, CBR tests, Computer with LCD screen, keyboard, mouse, connection cables. up and down compression trays. Supplied with printer and accessories for specific tests.</p> <p>Technical characteristics:</p> <ul style="list-style-type: none"> • Maximum load: 200 kN (compression / traction). • Distance between the compression plates: 700 mm. • Diameter of the compression plates: 180 mm. • Distance between columns: 610 mm. • Crossbar adjustment: ± 200 mm (total 400 mm). • Test speed range: 0.01 to 100 mm / min. • Load rate: from 1 N / s to 5 kN / s. • Displacement resolution: 0.01 mm with an accuracy greater than 0.2%. • Class 1 machine. • Power supply: 230V 50 Hz 850W. • Dimensions: 1350 x 510 x 2250 mm. 	2	€ 15,120.00	€ 30,240.00
		Charge cells of 2.5 kN, 10 kN, 25 kN, 50 kN	2	€ 2,420.00	€ 4,840.00
		<p>Caliper for modulus of elasticity in Brazilian test For 4 sensors on specimen Ø 5 H 5 cm. For 4 sensors according to new standard for specimen Ø 10 H 10 cm.</p>	2	€ 2,310.00	€ 4,620.00
	8.14 Mechanical tests				

			<p>Plate Compactor</p> <p>Plate compaction is used to make bituminous asphalt slabs with properties that are closest to those found on roads. The plates can be compacted at the mixing target densities using fillers that are equivalent to those of a compaction apparatus. Although the main function is to produce plates for roughness tests, the plates can be cut into beams or cores to provide specimens used in a variety of other tests (4 flex points or universal test rigs). Steel wheel roller segments, Model for compacting plates from 400x305x25 up to 100mm. Maximum compaction loads 38 kN (8bar), electronic control box, color screen, polycarbonate protection according to EC directive, power: 230 V 50/60 Hz 1ph 550W, Dimensions: 2200x1030x1880 mm</p>	2	€ 6,530.00	€ 13,060.00
			<p>Rutting test</p> <p>This equipment measures the resistance to rutting of asphalt under traffic. A test piece is subjected to repeated passages of a wheel under specific conditions of load, speed and temperature. During this test, the development of the deformation profile is continuously monitored. The rim allows the realization of test methods A and B specified in EN 12697-22. Comes complete with PC.</p>	2	€ 9,240.00	€ 18,480.00
		8.15 In situ tests				
			<p>Apparatus for spot volumetric technique</p> <p>Used to measure the macrotexture depth of the surface of a coating.</p> <p>Comprising:</p> <ul style="list-style-type: none"> • A calibrated cylinder of 25 cm³. • A shaving disc. 	12	€ 450.00	€ 5,400.00

			<p>Glass balls For spot volumetric technique according to standard EN13036-1 Replaces standard sand. Calibrated balls of which at least 90% of the mass passes through the 0.25 mm sieve and is retained by the 0.18 mm sieve. Delivered with verification report.</p>	12	€ 120.00	€ 1,440.00
			<p>Asphalt density measuring device Thanks to a non-destructive measurement method that does not use a radioactive source, the device makes it possible to determine the density of asphalt on site. The measurement time (3 seconds) allows a large number of results for quick decision making. Display density in kg / m³ and%, temperature and surface humidity. Features: <ul style="list-style-type: none"> • Depth of measurement: 25 to 100 mm. • Maximum temperature of the mix: 180 ° C. • Power supply: rechargeable batteries incl. • Autonomy: greater than 13 hours. • Recording capacity: 99 measurements. • Dimensions: 270 x 270 x 280 mm. </p>	3	€ 3,520.00	€ 10,560.00
			<p>SRT type friction pendulum For determining the roughness of a surface (according to P 18-578) and the Accelerated Polishing Coefficient (CPA) of chippings (according to EN 1097-8) with accessories. Basic equipment includes: <ul style="list-style-type: none"> • The pendulum. • Measuring slide. • Tooling and Thermometer -10 to + 110 ° C. • Transport case: 730 x 730 x 330 mm. </p>	3	€ 2,340.00	€ 7,020.00

		<p>Construction Drainometer Designed to measure properties related to the permeability of materials in hydrocarbon mixtures. The test consists of determining the percolation rate by measuring the average flow time of a determined quantity of water, with a low variable load, over a specified measuring surface.</p> <p>The equipment consists of:</p> <ul style="list-style-type: none"> • 1 site permeameter. • 1 electronic box with digital time display. • 1 hydraulic system with hand pump and 2 cylinders. 	3	€ 3,420.00	€ 10,260.00
		<p>Benkelman beam Particularly intended for the measurement of the deflection on pavements. Consisting of 2 light alloy parts, 3 adjustable stabilizing feet and 1 level.</p> <ul style="list-style-type: none"> • Distance between measuring end and axis of rotation: 240 cm. • Distance between axis of rotation and comparator: 120 cm. • Measure by digital comparator MT575113 supplied. <p>Delivered in a transport case.</p> <ul style="list-style-type: none"> • Dimensions: 2120 x 300 x 420 mm. 	3	€ 1,920.00	€ 5,760.00
	8.16 Road surveys				

		<p>Falling-weight deflectometer -FWD / HFWD type</p> <p>The falling-weight deflectometer (FWD / HFWD) is a non-destructive testing device designed to reproduce the passage of a truck by impacting a disk in contact with the ground, and simultaneously measure the deflections generated on the tested surface. These measurements make it possible to calculate the load bearing capacity of a platform or an edge, the elasticity moduli of each layer of the structure of a roadway, as well as their residual life, and then to calculate the thickness of the reinforcement layers.</p> <ul style="list-style-type: none"> • Number of deflection sensors: from 7 to 23. • Fall height sensor: High precision ultrasound. • Repeatability: less than 1%. • Dimensions: 3900 x 1700 x 1400 mm. • Power supply: 12 V DC. • Total weight: 450 kg. 	1	€ 82,100.00	€ 82,100.00
		<p>Longitudinal Laser Profilometer</p> <p>Class I inertial profilometer. It uses the combination of a laser and an accelerometer to measure the longitudinal elevation profile of the road, with very high degrees of precision and great speed. The profile is analyzed to calculate the IRI in m / km.</p> <ul style="list-style-type: none"> • Laser class: Laser 3B. • Scan speed: 16 kHz. • Wavelength: 780 nm. • Output power: 80 mW. • Interface: 10 Base T. • Ethernet: RS232 Analog. • Resolution: ± 0.025 mm or 0.01% full scale. • IRI resolution: ± 0.01 m / km. • Noise: 0.05 mm RMS • Degree of protection: IP65 (NEMA4). • Power supply: 12 V DC 1.2 A nominal, 4 A peak. • Dimensions: 355 mm x 240 mm x 140 mm. 	1	€ 8,520.00	€ 8,520.00

		<p>Ultrasonic transverse profilometer</p> <p>This system raises the transverse profile of the roadway through a series of 24 high quality ultrasonic sensors arranged along a bar fixed to the front or rear of a vehicle. The width of the survey can be defined by the user between 1 and 3.4 meters in increments of 12.5 cm. The main section of this 2.20 m profilometer can be extended up to 3.40 m with two extensions of 0.60 m. Transverse profile data is analyzed to determine rut depth for both left and right wheel paths. • Scanning speed: 100 Hz.</p> <ul style="list-style-type: none"> • Number of sensors: 24. • Distance between sensors: 125 mm. • Sensor resolution: ± 0.2 mm. • Survey width: Adjustable from 1 m to 3 m in steps of 0.125 m. • File Format: Microsoft Access® Post Processing File. • PC connectivity: Ethernet. • Protection class: IP68. • Dimensions: 2.2 m with 2 x 0.6 m of foldable extensions. • Weight: 25 kg. 	3	€ 6,520.00	€ 19,560.00
		9. Mineralogy			
		MP-AES Argilent 4210 Microwave Plasma Atomic Emission Spectrometer , delivered complete	2	€ 180,000.00	€ 360,000.00

		<p>Digital muffle oven. Heating on the 4 sides. Digital control. PID regulator. Temperature range 100 to 1200 ° C Temperature range 100 to 1200 ° C Very short heating time Programmable timer up to 99 h 59 min Resolution: 1 °C / 1 min Ceramic fiber heating system and heating on 4 sides. Delivered with a ceramic tray, protection against over-current and overheating, low weight and high-end insulation, comes with a secure door Internal dimension: 250 x 350 x 160 mm Outer dimension: 530 x 600 x 590 mm Power: 4.6 kW Power supply: 230 V, 50/60 Hz Capacity: 14 litres</p>	2	€ 3,640.00	€ 7,280.00
		<p>Forced convection oven - Baking oven, quenching, annealing, dissolving - Rapid heating - Ventilation (forced convection for greater temperature homogeneity) - Horizontal air circulation - Ability to load on several layers by inserting insert plates (1 plate delivered as standard) - PID control - Safe oven: thermocouple breakage in case of overheating - Temperature rise adjustable from 1 to 5000 minutes - Delayed start - Delivered on base - Volume: 30 Litres - Max temperature: 650 ° C - Excellent temperature homogeneity: $\Delta 8$ ° C - Standard programmer: 1 program of 2 segments, delayed start, LCD display</p>	2	€ 7,850.00	€ 15,700.00

		<p>High temperature laboratory furnace This compact high temperature furnace uses high quality materials and its ease of use makes it a versatile research and laboratory assistant.</p> <ul style="list-style-type: none"> - High quality heating modules made of molybdenum disilicide - High-quality fibrous material coating chamber - Stainless steel heatset - Double-walled housing with additional fan cooling for low outside temperatures - Guillotine door, driven by a chain, to allow safe opening and closing without destroying the fibrous insulation, the hot face being the farthest from the operator - Adjustable opening of the air inlet in the oven door - Exhaust air in the rear wall - Programmer P310 (9 programs of 40 segments + 2 special functions, eg blower or automatic valves) <p>Max. (° C) 1800; Volume (l) 8 Control Type C42 (9 programs of 9 segments) External dimensions (W x H x D) mm 470 x 750 x 850 Dimensions int. (W x H x D) mm 150 x 150 x 300 Power (kW) 9.0; Power supply 400 V 3 / N Empty weight (kg) 100; Door opening Guillotine PC connection</p>	2	€ 26,700.00	€ 53,400.00
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		<p>High resolution diffractometer / X-ray / XRD type TTRAX III Rigaku Uses a rotating 18kW anode X-ray source in a geometry θ / θ provides the ideal system for the most demanding applications. The diffraction thin film and the determination of the trace phases in the powder samples will greatly benefit from the high source; Designed for versatility, it integrates both the Transverse Optical Technology Beam (OBC) and a plan-independent broadcast axis to provide the widest possible range of measurement geometries without the need for system reconfiguration. Experimental capabilities include standard powder diffraction, grazing incidence diffraction, plane diffraction, high resolution diffraction, X-ray reflectivity, and small X-ray scattering angles (SAXS). TheEquipment can be configured with a wide range of optional attachments for maximum flexibility.</p>	1	€ 450,000.00	€ 450,000.00
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		<p>Ventilated universal oven Perfectly suitable for all drying, heating, keeping hot, hot air sterilization, component aging, hardening or thermal testing applications in laboratories and all branches of industry. It is ventilated to obtain precision and a maximum thermal homogeneity. Performance Maximum temperature: 300 ° C Minimum temperature: Ambient temperature + 10 ° C Maximum air change rate: 10 m³ / h Temperature stability: <± 0.2 ° C Inner volume: 58 litres Chrome-plated steel shelves Number of shelves: 2 delivered / 6 maximum in the oven Shelf dimensions: 370 x 330 mm Maximum permissible weight per shelf: 30 kg Total weight in the oven: 60 kg (weight not included) Power supply & Misc. Voltage: 230V ~ 1P 50 / 60Hz, 10A Heating power: 1500 W Number of doors: 1 Weight Load : 50 kg Oven interior lighting: yes Inner fan speed controller : yes Delivered with door visibility window, Weekly digital clock, Ventilation and heating shutoff when door is opened, 60mm diameter lateral passage (center left-hand side, key lock, air assist extractor, temperature programmer (4 prog 16 segments), programmer and 3-way digital recorder</p>	2	€ 6,540.00	€ 13,080.00
		Skyray EDX600 XRF Energy-dispersive X-Ray Fluorescence X-Ray Spectrophotometer	2	€ 90,000.00	€ 180,000.00
		Portable X-ray fluorescence X-ray spectrophotometer	4	€ 25,000.00	€ 100,000.00

		<p>Dual beam UV / visible spectrophotometer - Fixed bandwidth type Uvikon XS - SECOMAM High spectral purity optics Mechanics of watchmaking tradition - 0.3 nm accuracy - No drift in time Optical bench made of cast aluminum Incomparable measurement stability in both absorbance and wavelength Latest generation electronics - DSP acquisition technology - Optimized measurement noise Delivered with software + RS 232 cable, standard thermostatable tub holder compatible with Micro and Ultra Micro tubs, accessory control port for connection of accessories and user manual + a computer (Min. Configuration: i7 - Hard disk: 2 TB) & printer</p>	2	€ 32,088.00	€ 64,176.00
		<p>PCR Hood CaptairBio 712 + Particulate Filter HEPA H14 - Erlab Designed for non-pathogenic applications that have a high risk of cross-contamination, the range of CaptairBio PCR hoods allows handling in an ultra-clean environment and the decontamination of the working volume by UV radiation without risk of exposure to the operator. Filter hood type Individual + environment protection Aspirant + filtration flow technique Width (mm) 1820 Oblong Opening System External dimensions (W x H x D) mm 1820 x (1340 min / 1515 max) x 749 Dimensions int. (W x H x D) mm 1697 x 1052 x 749 Initial airflow velocity (m / s) 0.4 to 0.6 Volume of air (m³ / h) 880 Number of filtration columns 4 Comes complete with accessories</p>	3	€ 12,500.00	€ 37,500.00

		Precision balances (0.0001 g)	4	€ 3,520.00	€ 14,080.00
		Hotplate	4	€ 120.00	€ 480.00
		10. TOPOGRAPHY			
		<p>Total Station + Accessories (Complete) This device makes it possible to aim distant points thanks to a telescope and to measure horizontal and vertical angles in grades via graduated circles.</p> <ul style="list-style-type: none"> • LCD screen on both sides: 8 lines of 20 characters. • Magnification of the telescope: x 30. • Minimum aim: 1 m. • Accuracy on angles: 2 or 5 ". • Measurable distance: <ul style="list-style-type: none"> - without reflection: 350 m. - with 1 prism: 4000 m. - with 3 prisms: 5,000 m. • Distance accuracy: 2 mm + 2 ppmxD. • Memory capacity: 30,000 values. • Transmission port: RS232C, USB, SD card. • Format of transmitted data: .XLS or .DXF. • Battery: rechargeable NiH. • Charging time: 3.5 h. • Usage time: 15 to 45 hours depending on the distance measurement method. • Charging time: 3.5 h. • Usage time: 15 to 45 hours depending on the distance measurement method. 	5	€ 6,500.00	€ 32,500.00
		<p>Electronic Theodolite + accessories (complete) Robustness with dual digital screen for greater ease of use. With integrated vertical automatic compensator.</p> <ul style="list-style-type: none"> • Accuracy: 2 or 5 ". • 42 mm lens. • Magnification: 30 times. • Power supply: 4 x AA batteries (80 h battery life). 	12	€ 1,250.00	€ 15,000.00

			<p>Automatic optical levels + accessories (complete) Precise and powerful.</p> <ul style="list-style-type: none"> • Magnification: 32 times. • Automatic compensation. • Opening of the lens: 36 mm. • Accuracy: $\pm 0.3''$ / min Comes complete in shockproof case, with aluminum tripod and 4 x 1 aluminum test pattern. 	12	€ 2,550.00	€ 30,600.00
			GPS outdoor receiver	24	€ 650.00	€ 15,600.00
			Differential GPS complete type Leica VIVA GS16	3	€ 16,500.00	€ 49,500.00
			<p>Motorized automatic laser for horizontal or vertical planes</p> <ul style="list-style-type: none"> • Tilt of the head: 9 °. • Range: 300 m. • Accuracy: Horizontal: ± 0.10 mm / m and vertical: ± 0.15 mm / m. • Rotation speed: 200 or 700 rpm. • Square point. • Scan mode. • Tilt function. • Remote control with a range of 50 m. • Power supply: rechargeable NiMh battery pack (24h autonomy). • IP 54 waterproof housing. • Delivered complete with box, tripod, sight, battery, charger, receiving cell and pair of laser vision glasses. 	5	€ 2,250.00	€ 11,250.00

			<p>Precision Satellite Surveying</p> <p>This positioning system is a high-precision satellite receiver and communication unit specifically designed for the surveying market. Simple and robust, it includes all components for field studies and staking.</p> <ul style="list-style-type: none"> • Channel configuration: 136 channels (dual frequency) for simultaneous tracking of all visible satellites. • RTK performance: <ul style="list-style-type: none"> - Horizontal accuracy: 1 cm + 1 ppm. - Vertical precision: 2 cm + 1 ppm. • Static performances: <ul style="list-style-type: none"> - Horizontal accuracy: 2 mm + 0.5 ppm. - Vertical precision: 5 mm + 0.5 ppm. • Bluetooth available. • Waterproof housing: IP67. • Dimensions: 198 mm x 99 mm. 	5	€ 16,950.00	€ 84,750.00

		Telefix (set of 3 pieces of 3m, 5m and 8m) For vertical or horizontal internal or external measurements. Sliding tape inside the cane. Easy reading of the measurement. Control of verticality and horizontality with 2 levels. Automatic locking of the elements in completely unfolded position.	5	€ 650.00	€ 3,250.00
		Lasermeter, range 100 m	5	€ 550.00	€ 2,750.00
		Odometer Its wheel circumference 1 m allows measurements of undeveloped soil or strong wind. Up / down counter 9,999.99 m with reset by lever operation, reading cm. • 16 cm folding kickstand. • Folding steel handle. • Bag or carrying case.	12	€ 450.00	€ 5,400.00
		Drone type DJI S1000 Delivered with solution lidar type Phoenix AL3-16 and software	3	€ 55,000.00	€ 165,000.00
		11. General equipment			
		Stainless steel water distiller. Has an automatic system for constant water level in the tank Distillation capacity: 5 l / h Electrical power: 4000W Power supply: 220 V - Single phase - 50 Hz	3	€ 710.00	€ 2,130.00
		Gasoline hammer type Wacker BH23 , delivered with: - 2 complete sets Hammer head - 2 complete sets Hammer adapter (S, M and L)	3	€ 5,714.00	€ 17,142.00

		Piezometric water level probe , with diode, acoustic signal and thermometer, 200m probe, delivered with Leather case for transport and storage	3	€ 1,500.00	€ 4,500.00
		Plummet probe with depth indication every meter (L = 350 meter) delivered with leather case for transport and storage	3	€ 710.00	€ 2,130.00
		CXL type cable detector with LCD screen, 4-position selector, audible / visual response (calibration not necessary)	3	€ 1,320.00	€ 3,960.00
		Storage bin for soil samples (109 x 58 x 11 cm)	15	€ 35.00	€ 525.00
		<p>UNIVERSAL DIDACTIC TEST PORTIC</p> <p>For tests on parts close to reality. Specially studied for teaching. With the same basic unit, by simple change of position of the cylinder and addition of accessories corresponding to the desired test, this gantry replaces the conventional machines for compression, traction, bending, shearing, tearing on building materials, metals, wood, composites. An interface allows the acquisition and visualization of the curves, in real time, on a PC. Measurement by electronic pressure sensor. Cylinder stroke 160 mm. Equipped with 1 or 2 cylinders according to the type of tests (200kN in thrust, 150kN in traction and / or 50kN in thrust and 36kN in traction.)</p> <p>Separate control panel with integrated PC.</p> <p>Standard software: display of pressure sensor measurement over time.</p> <ul style="list-style-type: none"> • Power supply: three-phase 380 V + Neutral. • Power: 1 kW. • Dimensions: 960 x 1040 x 140 mm. <p>Delivered with: 2 CHANNELS AUTO DIDACTIC BENCH 2-CYLINDER DIDACTICAL BENCH, 4X4X16 COMPRESSION TEST, 3-UP FLEXION TEST, SHEAR TESTING ON WOOD, SHEAR TEST, TRACTION TEST WITH CLAMPS, TRACTION TEST ON WOOD, 20mm LVDT INDUCTIVE SENSOR, SPLASHING TEST, INFLATABLE BEAM TEST, 4X4X16 FLEXION TEST</p>	1	€ 39,760.00	€ 39,760.00

		<p>Electronic strobe Observation of objects in motion, determination of oscillation frequencies and rotational speeds.</p> <ul style="list-style-type: none"> • Display: 10,000 pt (LED), indicates the number laps or the number of flashes / min. • Frequency: 100 to 1000 flashes / min and 1,000 to 10,000 lightning / min. • Accuracy: ± 1 pt from 100 to 5000 flashes / min and $\pm 0.5\%$ beyond. • Flash duration: 60 to 1000 μs. • Illumination angle: 80 $^{\circ}$. • Power supply: 220 V - 50/60 Hz. • Dimensions: 210 x 120 x 120 mm. 	3	€ 1,100.00	€ 3,300.00
		<p>Radiometer A radiation tracking apparatus producing a loud and clear audible signal when a predefined dose of Gamma or X rays has been achieved. Simple and robust with an easy-to-read display when the device is in a shirt pocket.</p> <ul style="list-style-type: none"> • Signal frequency: <ul style="list-style-type: none"> - Background radiation: a signal every 20 - 50 seconds. - 10 Sv / h (1 mR / h): an audible signal every 20 seconds. - 1 mSv / h (100 mR / h): a continuous audible signal up to about 60 Sv / h. • Energy level: 45 keV to 1.2 MeV. • Temperature range: -20 to 50 $^{\circ}$ C. • Dimensions: 152 x 35 x 16 mm. • Weight: 110 g. 	3	€ 740.00	€ 2,220.00

		<p>Tachometer with digital display combined with and without contact For linear measurement in m / min or rpm.</p> <ul style="list-style-type: none"> • Memorization of max / min values. • Measurement range: <ul style="list-style-type: none"> - By photoreflection: from 5 to 100,000 rpm. - By contact: from 0.5 to 20 000 rpm and from 0.5 to 2000 rpm. • Answer <5 seconds. • Power supply: 4 x 1.5 V batteries • Autonomy 50 hours. • Dimensions: 65 x 38 x 218 mm. • Weight: 300 g. <p>Delivered with conical tip and wheel circumference 10 cm (for linear speed).</p>	3	€ 350.00	€ 1,050.00
		<p>Digital sound level meter For the control of noise nuisances.</p> <ul style="list-style-type: none"> • LCD display. • 2 response curves: dBA (noise) and dBC. • 2 measurement ranges low 35 to 100 dB - high 65 to 130 dB. • Memorizing the maximum sound level. • 2 integration times: 0.2 s (fast) and 1.5 s. • Indication of overflow and wear of the battery. • Calibration: internal oscillator 1 kHz sinusoidal - 94 dB. • 9 V battery power supply • 10 mV / dB analog output. • Dimensions: 240 x 68 x 25 mm. 	3	€ 450.00	€ 1,350.00

		<p>Manual pocket counter For counting objects, traffic, etc. Held easily in the palm of the hand, 4 digits with discount to zero. Adds a unit each time the key is pressed. A support can be provided for tabletop use.</p>	5	€ 210.00	€ 1,050.00
		<p>Electronic moisture meter with spikes at 2 scales Measurement of material moisture directly displayed as a percentage of overall mass using characteristic curves of building materials and wood stored in the device.</p> <ul style="list-style-type: none"> • Two points are stitched in the material to be examined. • Characteristic curves for building materials and wood (7 channels). • Backlit screen, Hold function. • Self-test function with accessory integrated in the protective cover. • Incl. 2 AAA batteries, strap and belt pouch. • Ambient humidity measurement with capacitive sensor, calculation of the dew point. • Delivered with wrist strap, belt pouch, protective cover and batteries. • Measurement ranges: <ul style="list-style-type: none"> - Wood: 6 to 44%. - Materials 0.2 to 2%. • Precision: <ul style="list-style-type: none"> - Wood $\pm 1\%$. - Materials: $\pm 0.05\%$. • From 5 to 95% RH from 0 to + 50 ° C with accuracy $\pm 3\%$ RH and ± 0.5 ° C to 25 ° C. • Measuring ranges: <ul style="list-style-type: none"> - Wood: 6 to 44%. - Materials 0.2 to 2%. • Accuracy: <ul style="list-style-type: none"> - Wood $\pm 1\%$. - Materials: $\pm 0.05\%$. • From 5 to 95% RH from 0 to + 50 ° C with accuracy $\pm 3\%$ RH and ± 0.5 ° C to 25 ° C. 	3	€ 410.00	€ 1,230.00

		<p>Construction site hygrometer</p> <ul style="list-style-type: none"> • Temperature 0 ° C to 50 ° C. • Humidity 25% to 98% RH. • Memory recall of the minimum-maximum. • ABS case - Battery 357. • Dimensions: 145 x 30 x 24 mm. 	3	€ 110.00	€ 330.00
		<p>Recorder thermometer / hygrometer with fixed external probe</p> <ul style="list-style-type: none"> • Programmable rate with a measuring interval between 2 s and 24 h. • Ability to memorize 1 million values and return them to a PC. • LCD display. • Autonomy > 3 years (for a measurement rate of 15 minutes). • IP54 protection. • SD card slot (not supplied). • USB cable and software provided. • Dimensions: 89 x 53 x 27 mm. 	3	€ 150.00	€ 450.00
		<p>Room temperature thermohygrograph with mechanical movement</p> <p>Allows recording on both sides of the chart simultaneously:</p> <ul style="list-style-type: none"> • Hygrometry from 0 to 100%. • Temperature from - 35 to + 45 ° C. • 2 speeds: 1 rotation of the drum in 1 or 7 days. • Dimensions: 375 x 290 x 230 mm. 	3	€ 325.00	€ 975.00
		<p>Direct reading cylindrical rain gauge</p> <ul style="list-style-type: none"> • Capacity 40 mm / m². • ABS. • Stick mounting (not included). • Dimensions: 200 x 125 mm. 	12	€ 15.00	€ 180.00

		<p>Digital room thermohygrometer With dual display</p> <ul style="list-style-type: none"> • 1st indoor display indicates temperature 0 to 50 ° C and humidity 25 to 95% RH. • 2nd peripheral display connected to a probe and 3 m of cable, indicates the temperature at the end of the probe - 50 to + 70 ° C at 0.1 ° C. Memory Function Stores the minimum / maximum values of the temperature at the end of the probe. Uses 2 x 1.5 V AA batteries. • Dimensions: 154 x 80 x 25.5 mm. 	12	€ 150.00	€ 1,800.00
		<p>Digital electronic weather station</p> <ul style="list-style-type: none"> • Extra large backlit screen. • Multi-display: clock / alarm, temperature and humidity on several channels (station and sensor (s)), atmospheric pressure, moon cycle, barometric trend and weather forecast. • Delivered with 1 sensor (92 x 60 x 21 mm) and its base. • Transmission frequency: 433 Hz. • Power supply: 4 x 1.5 V batteries. • Dimensions: 182 x 133 x 28 mm. 	12	€ 60.00	€ 720.00

		<p>Propeller anemometer Propeller anemometer with ambient temperature measurement (NTC), protective cover, belt case, wrist strap, batteries and calibration protocol</p> <ul style="list-style-type: none"> • Calculation of the time average. • Hold function / min / max. • Calculation of the wind speed (beaufort scale). • Backlit screen. • Storage temperature: -20 ... + 70 ° C. • Operating temperature: -10 ... + 50 ° C. • Type of batteries: 2 AAA cute batteries. • Autonomy: 100 h. • Dimensions: 133 x 46 x 25 mm. 	12	€ 210.00	€ 2,520.00
		<p>Digital comparator + magnetic base support Output for PC or printer with acquisition software. Suitable for any type of comparator.</p> <ul style="list-style-type: none"> • Force of attraction: 80 kg. • Rod Ø 16 mm. <p>Delivered in wooden box.</p>	12	€ 210.00	€ 2,520.00
		<p>100 m measuring tape Polyamide coated steel tape.</p> <ul style="list-style-type: none"> • Width 13 mm. • ABS reinforced handle. • Zero to loop, end hook. • Graduation in mm. • Lengths: 100 m 	12	€ 25.00	€ 300.00
		mechanical Vernier caliper	12	€ 25.00	€ 300.00
		Digital mechanical caliper	12	€ 40.00	€ 480.00
		Mechanical depth gauge	12	€ 35.00	€ 420.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

			Digital micrometer <ul style="list-style-type: none"> • Carbide button with calibration standard. • 0.01 mm accuracy. Set of 4 micrometers: Capacities 0-25, 25-50, 50-75, 75-100 mm. 	12	€ 85.00	€ 1,020.00
			Precision counter 0 - 24 hours <ul style="list-style-type: none"> • Stop / counter timer with end of cycle alarm. • Resolution 1 second. • After the alarm the time passed is indicated. 	12	€ 55.00	€ 660.00
			Quartz counter 0 - 60 min With powerful alarm at the end of the cycle. <ul style="list-style-type: none"> • Dimensions: 58 x 58 x 23 mm. 	12	€ 60.00	€ 720.00
			Electronic stopwatch Professional type, splash- proof. 3 functions: Chrono, clock, calendar. <ul style="list-style-type: none"> • Dimensions: 80 x 57 x 19 mm. • Weight: 80 g. 	12	€ 45.00	€ 540.00
			Mechanical stopwatch With metal case. <ul style="list-style-type: none"> • Functions: 30 min to 1/5 sec. 	12	€ 35.00	€ 420.00
			Clock counter-timer <ul style="list-style-type: none"> • Countdown 0 to 24 hours to ± 1 s. • Audible alarm duration 1 min at end of counting with indication of the time of overflow after alarm. • Memory of the programmed time. • Dial illumination. • Large LCD display. • Autonomy 12 months. 	12	€ 55.00	€ 660.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

			<p>Digital probe thermometer Especially suitable for temperature measurement in fresh concrete</p> <ul style="list-style-type: none"> • Stainless steel Ø 4 mm, L 200 mm. • Rotatable rectangular dial. • Digital reading: - 50 ° C + 300 ° C ± 0.5 ° C. 	12	€ 50.00	€ 600.00
			<p>Thermometer probe dial With steel rod Ø 8 mm, length 250 mm and reading dial Ø 50 mm.z Supplied in set of 3 thermometers: 0 + 60 °, 0 + 250 °, -40 + 40 ° C</p>	12	€ 290.00	€ 3,480.00
			<p>Digital probe thermometer - 50 ° C + 300 ° C</p> <ul style="list-style-type: none"> • Resolution: ± 0.1 ° C. • Memory function. • Maximum mini alarm: trigger an audible alarm when the threshold is reached. (set of 3 pieces) Delivered with probe in stainless steel and 1 m of cable. • Dimensions: 107 x 59 x 20 mm. 	12	€ 180.00	€ 2,160.00
			<p>Laboratory glass thermometer Supplied in set of 4 pieces: -1 + 51 °, -10 + 110 °, +30 + 200 °, 0 + 300 ° C</p>	12	€ 300.00	€ 3,600.00
			<p>LCD thermometer with maxi-mini alarm, - 50 ° C to + 300 ° C Set of 5, Supplied with 25 cm detachable stainless steel probe.</p> <ul style="list-style-type: none"> • Accuracy ± 0.1 ° C. • Selection accuracy of the response time: normal 10 s, fast 1 s. • Shell, protective case and waterproof probe included. • Programmable alarm. • ABS case - R03 battery. • Dimensions: 170 x 70 x 30 mm 	12	€ 220.00	€ 2,640.00
			<p>Calibration Weight Series Numbered Class M1 - E1 - E2 - F1 - F2</p>	12	€ 650.00	€ 7,800.00

		<p>Combustion device for fire behavior of building materials Determines the flammability of construction products that are tested using a small flame, acting directly, without additional heat radiation in a vertical arrangement.</p> <ul style="list-style-type: none"> • Sample size: 250 x 90 x ≤ 60 mm or 250 x 180 x ≤ 60 mm. • Burner: vertical and tiltable to 45° with valve for micro-adjustment of the flame. • Power supply: 230 V, 50 Hz, max. 60 W. • Dimensions: 700 x 400 x 970 mm. 	2	€ 16,500.00	€ 33,000.00
		<p>Foldable transport trolley loads up to 250 kg Reinforced steel plate.</p> <ul style="list-style-type: none"> • Anti slip carpet. • Safety bumpers. • Heavy duty castors: steel rims, wide running surface. • Small footprint folded. 	12	€ 350.00	€ 4,200.00
		<p>Ceramic heating plate Main advantages of glass ceramics:</p> <ul style="list-style-type: none"> • Chemically resistant. • Flat and non-porous heating surface easy to maintain. • Low thermal expansion. • Resistance to thermal shocks, can withstand being sprayed with cold water. • Excellent energy efficiency. • Operating temperature range + 50 to + 600 ° C. • Built-in automatic temperature controller. • Power supply: 230 V 50/60 Hz. • Model: plate 280 x 280, heater ø155 mm power 0.9 kW 	12	€ 180.00	€ 2,160.00
		<p>Steel heating plate With multiposition temperature control. Model: Dimensions 300 x 400, power 2800 W</p>	12	€ 150.00	€ 1,800.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		<p>Laboratory oven, General Purpose - Natural ventilation. Construction all galvanized steel with exterior covered with stainless steel sheet. Double wall with fiberglass insulation 60 mm thick. Temperature range adjustable from ambient to + 200 ° C.</p> <ul style="list-style-type: none"> • Analog thermostat adjustment with engraved dial. • Sleeve at the top to house a thermometer (not supplied). • On / off switch with indicator light. • Heating indication light. • Supplied with two galvanized steel shelves positionable at different heights. • Power supply: 230 V 50 Hz 1 Ph. • Dimensions: 900 x 700 x 700 mm 	3	€ 5,550.00	€ 16,650.00
		Scales and balances (100kg, 20kg, 10kg, 2kg, 1kg, 500kg, 200kg and 1000kg)	3	€ 4,800.00	€ 14,400.00
		Metal or porcelain bowls, metal jars with and without lids	12	€ 250.00	€ 3,000.00
		Mortar and pestle to be sprayed (porcelain)	12	€ 150.00	€ 1,800.00
		<p>Vacuum pumps and bells + accessories Provides a vacuum of 730 mm HG.</p> <ul style="list-style-type: none"> • Air flow: 5 m³ / h. • Intensity: 3 A. • Food; 220 V mono. 	3	€ 1,530.00	€ 4,590.00
		<p>Hammers (set of 3 pieces)</p> <ul style="list-style-type: none"> - Rubber mass Ø 50 mm - Mallet 1 kg - Hammer 300 g 	12	€ 60.00	€ 720.00
		Diesel generator set (+/- 7 to 10 KVA)	2	€ 10,000.00	€ 20,000.00
		Flexible stainless steel spatulas Set of 4 pieces of blade length: 100, 150, 200 and 300 mm	12	€ 150.00	€ 1,800.00
		Stainless steel rigid spatulas Set of 3 pieces of blade length: 20, 50, 70 mm	12	€ 150.00	€ 1,800.00

Annex 2 to the Final Report: Financing of Road Research Laboratory (RRL) Equipments

		Brushes specially designed for the cleaning of screens Comprising: Nylon plate width 62 mm, Pouch Ø 35 mm, Set of 2 nylon brushes, Double nylon / brass, brass Brush	12	€ 80.00	€ 960.00
		Shelf (stainless steel) to store tubes - Capacity 4 x 10 sounding tubes	5	€ 1,310.00	€ 6,550.00
TOTAL (purchase price without transport costs or customs)					€ 7,814,245.00