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TECHNICAL SPECIFICATION

LIGHT WEIGHT MOBILE WATER TREATMENT UNITS FOR TURBID RIVER WATER

Model standard LAMELLA W CP 5/G SK

EMS WATER TECHNOLOGY S.r.l.
P.I./C.F./ R.I. di Mantova 03930380245 – n. REA MN-257801
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COMPARATIVE TABLES

In the interest of clarity please find below tables which include EMS's comments and cross references:

Light weight Mobile water treatment units for turbid river water and to be fitted with a towing system, capacity of 4-5 m³/hr

Item	Name of Goods or Related Services	Technical Specificationsand Standards	Data
1	Raw water	Cloudy and muddy, specifically designed to treat elevated turbidity levels of up to 200 NTU (nephelometric Turbidity Units)	X
2	Final product (Treated water)	Safe drinking water conforming to WHO guidelines (10-15NTU)	X
3	Capacity	4-5 m³/hr and should run for up to 12 hours per day but not less than 7 hours for continuous operations.	4-5 m³/hr Depending on raw water quality
4	The compact system	Should have integrated flocculation units, sedimentation and settlement units, sand filtration system, activated carbon modules and chlorination treatment stages.	X
	Sedimentation station	Double sedimentation i.e. rapid sedimentation with cyclone separator & slow sedimentation by settler.	X
	Filtration	Back washable and rapid and deep bed filtration	X
		Back washable activated carbon unit for the absorption of organic compounds	X
	Chlorination	Pre & post chlorination by calcium hypochlorite with electronic metering pump	X
5	The system	The equipment should be easy to assemble and service.	X
6	Water intake system	Submersible pump with floating device & flexible pipe for sources including rivers, shallow well and water pans.	X
7	Manuals	The manuals should illustrate the equipment setting, specifications and application guidelines. All instructions should be in English language.	X
8	Power source	Generator, diesel propelled with a robust control panel	OPTIONAL

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1. TECHNICAL SPECIFICATIONS

The following technical Specifications form our technical offer and describe one single Mobile Drinking Water Treatment Unit EMS **LAMELLA W CP 5/G SK**.

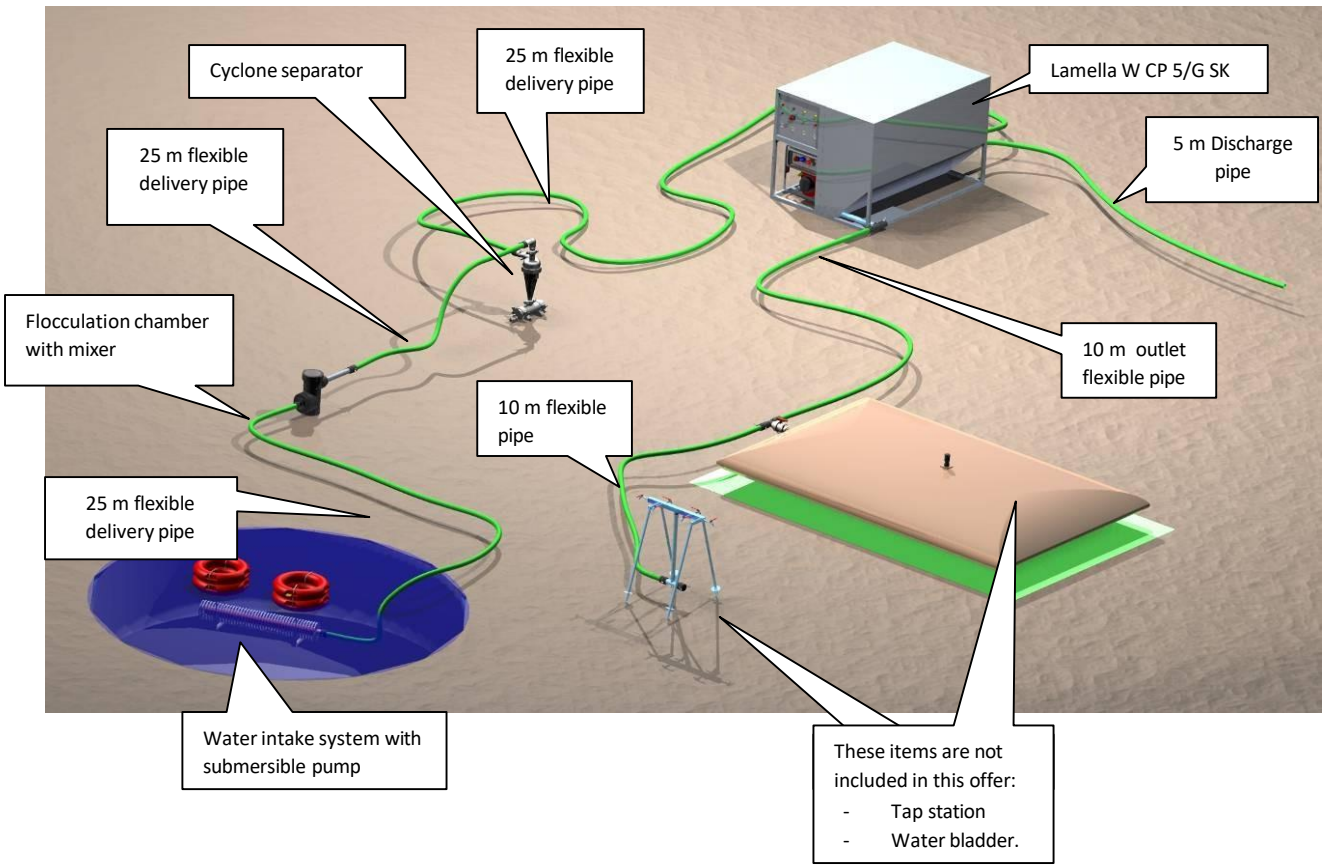
2.1 **Treatment Capability**

The EMS Mobile Water Treatment Unit, **will be designed to produce 4 m³/hr** at 20 TMH (total manometric head) of safe drinking water (in accordance with WHO recommendations for drinking water) from any water source, conventional or non conventional such as rivers, lakes, shallow wells, reservoirs, harvested rainwater and groundwater with a maximum turbidity of 80-200 NTU (Nephelometric Turbidity Units).

The treated water flow rate depends on the raw water quality.

The proposed unit IS NOT A DESALINATION UNIT.

The produced water will be free of physical and bacteriological contamination, but will not take care of industrial contamination such as hydrocarbons, chemical waste etc.



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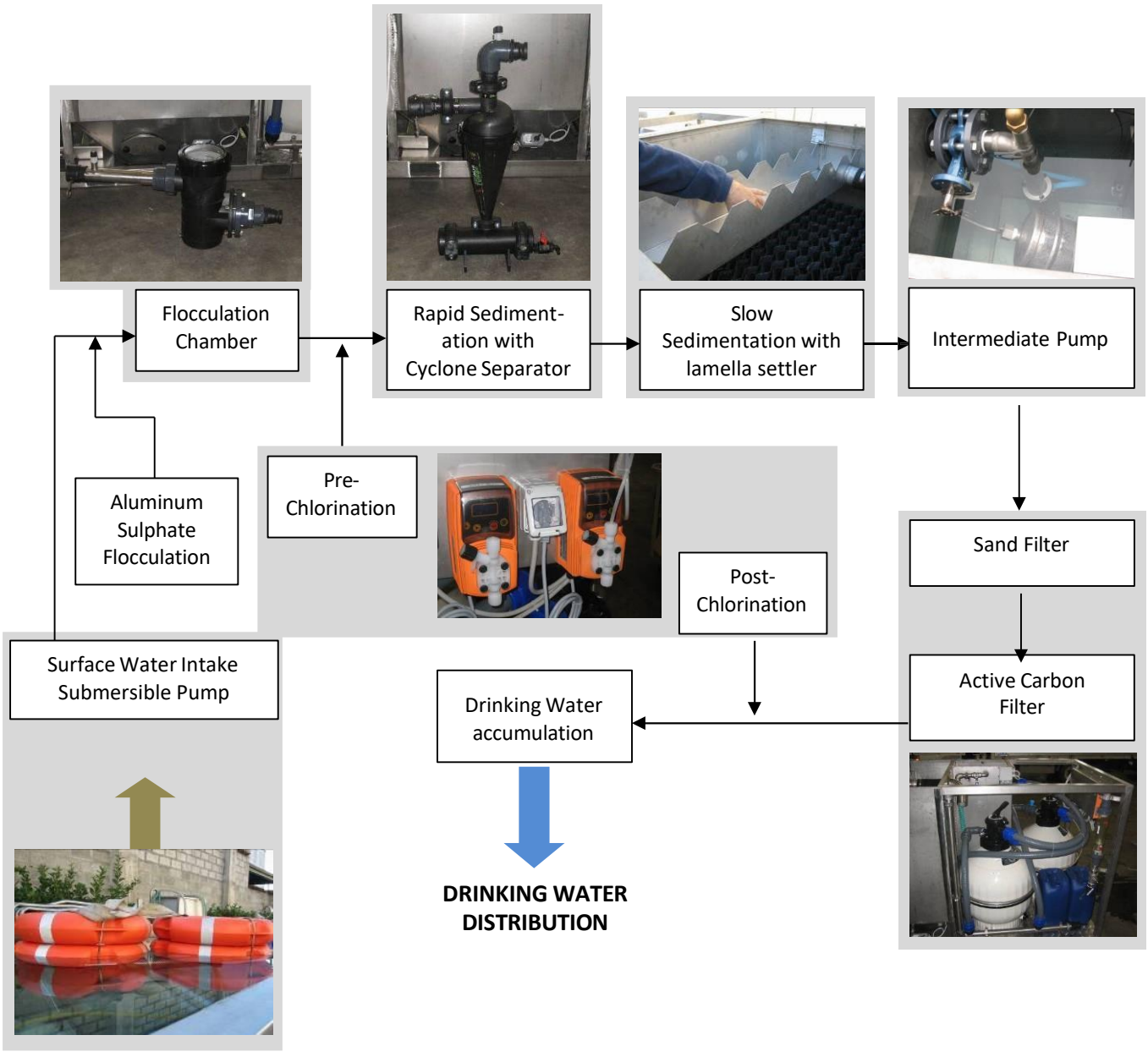
2.2 Treatment Process

The treatment process, complete with tanks and pumps is illustrated in the flow diagram below:



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3. TECHNICAL DESCRIPTION AND SCOPE OF SINGLE UNITS

3.1) Surface water intake system with a submersible pump and electric motor

The Surface Water Intake System includes a submersible centrifugal pump with stainless steel mesh filter screen, floating device, flexible intake pipes, electric cable and anchoring system. The pump is connected to the side of the “EMS LAMELLA W CP 5/G SK”

We have provided for a submersible well pump that can function both **vertically and horizontally.**

Quantity of pumps	One (1)
Type	Submersible, centrifugal, multi impeller
Max flow rate	5 m^3 /hr
Head	2.4 Bar (24 m of H2O column)
Materials	Stainless Steel AISI 304
Electric motor	3x380 V. 50 Hz –0.75 Kw – 2900RPM

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3.2) Coagulation unit by aluminium sulphate

This is a pre-treatment stage of the process and is necessary to render the eventual turbidity in the water, more filterable in the successive stages.

For this service we have proposed an electronic metering pump which ensures precision and reliability Characteristics for each metering pump:

Flow rate	0-2 lt/hr
Head	4 Bar (maximum)
Materials	PVC / PP / PVDF
Electric motor	2x220 V 50 Hz –0.1 Kw
Accessories:	Mixer in line 2” diameter with quick-coupling
	70 m 2” flexible pipe with quick couplings

3.3) Pre and Post Chlorination by calcium hypochlorite

This is an important treatment stage of the process and is necessary to eliminate all organic compounds in the water. Knowing the problems and difficulties associated with the transport and storage of sodium hypochlorite, we offer the choice of using calcium hypochlorite.

For this service we have proposed an electronic metering pump, as shown in the picture above.

In order to carry out post-chlorination, two calcium hypochlorite metering pumps have been provided for, one for pre-chlorination and one for post-chlorination.

3.4) Flocculation chamber

For this service we have proposed:
One (1) Flocculation chamber, quick-opening type, with the following technical characteristics:

Diameter	200 mm
Total Higher	500 mm
Body Material	PP + fiberglass moulded
Connections	2” with quick-coupling

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3.5) Sedimentation Station

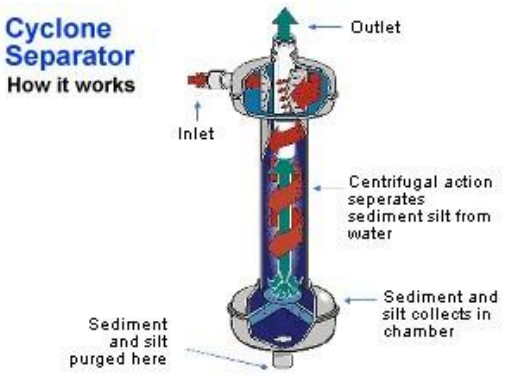
The proposed treatment unit is a “general purpose” system, and not knowing all the characteristics of the water to be treated, the various stages of treatment must ensure the best possible function in all possible operative conditions.
Since the specification includes a provision to treat the water turbidity of 200 NTU (very high value) to deal with a similar turbidity shows a double sedimentation:

-A rapid sedimentation with cyclone separator
-A SLOW sedimentation by lamella settler

The characteristics of the cyclone separator are described below:

Characteristics

Separation system	
Type	
Max flow rate	: 8 m³/hr
Max working pressure	: 5 Bar
Materials	: HDPE



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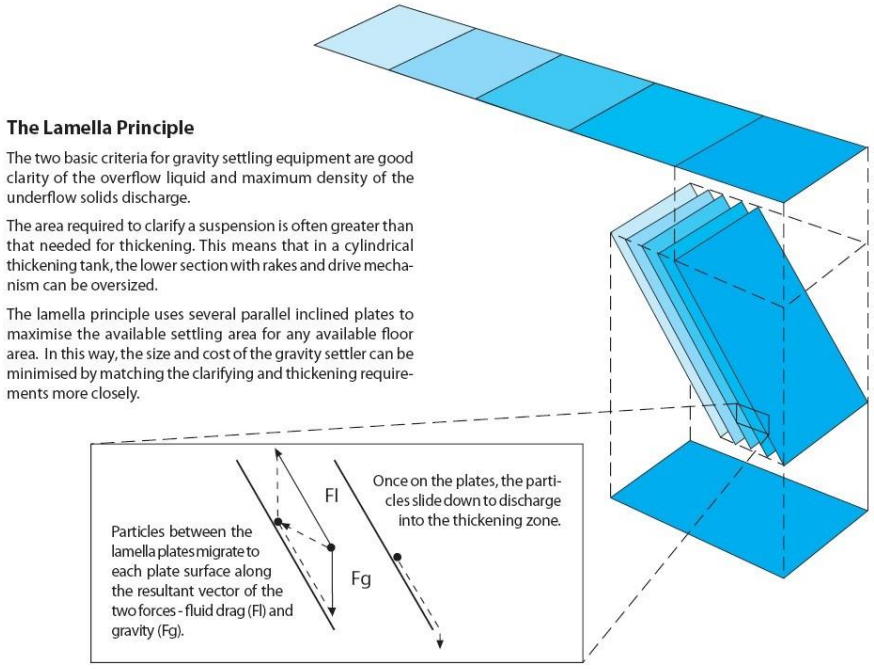
SLOW sedimentation by lamella settler:

PRINCIPLES OF LAMELLA SEDIMENTATION

Given that the water immediately undergoes a Rapid sedimentation with cyclone separator, in order to obtain a more secure sedimentation we have proposed a second stage, “slow sedimentation”, with a **lamella settler** which functions according to the following principles indicated in the figure below:



The sedimentation is based on the “projected surfaces” principle in which it is possible to achieve valid sedimentation with a drastic reduction of occupied space; the technical data of the proposed unit is illustrated on the following page.

Following the second stage of sedimentation it is necessary to re-launch the clarified water the successive and carbon filters, and for this we propose a horizontal centrifugal pump with electric motor.

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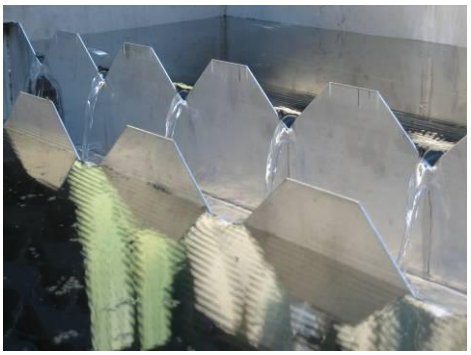
For the second stage of sedimentation we have proposed:

One (1) Lamella settler composed of a Stainless Steel AISI 304 and parallel-piped tank with the following characteristics:

Base dimensions	1100 x 750 mm
Total Higher	1200 mm
Material	Stainless Steel AISI 304
Connections	2” with quick-coupling
Accessories:	Mixer in line 2” diameter with quick-coupling

Lamella pack technical characteristics:

Base dimensions	1100 x 750 mm
Total Higher	600 mm
Material	Polypropylene moulded
Type	Cross flow “wave 27”
Pack volume	0.45 m³
Projected volume	28.5 mq x m³
c. i. factor	0.7
Pack projected surface	0.45 x 28.5 = 12.8 mq
Theoretical flow rate	12.8 x 0.7 = 8.96 m³/hr
Effective flow rate	4-5 m³/hr



Lifting pump to feed filtration system

One (1) Horizontal pump, electric motor driven, with the following technical characteristics:

Flow rate	6 m³ /hr
Head	1.4 Bar (14 m of H2O column)
Materials	Stainless Steel AISI 304
Electric motor	3x380 V. 50 Hz –0.75 Kw – 2900RPM

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3.6) Back washable rapid & deep-bed filtration
Back washable activated carbon unit for the absorption of organic compounds

The unit includes a sand filter and an activated carbon filter. The sand filter is able to treat the total turbidity and settleable matter potentially present in the water, rendering it, at the end of the process, perfectly clear and crystalline; the activated carbon filter treats any excess free chlorine (resulting from preceding treatments) as well as all organic compounds and any undesirable odours and tastes that may be present, rendering the water perfectly safe and drinkable.

Quantity of filters	Two (2) (one (1) Sand and one (1) Activated Carbon Filter)
Characteristics of each filter:	
Filter Diameter	600 mm
Total High	1080 mm
Maximum backwash time	10 to 15 min
Maximum delta P	0.4 bar
Design Pressure	3 bar
Backwash	Manual with multi-positio
Material	Injected polypropylene
Operating Flow Rate	4-5 m³/hr

The proposed fillings are the following:
Sand Filter: High purity quartz washed and de-dusted
Activated carbon filter: top grade Granular Activated Carbon (GAC), specific for the treatment of drinking water; this type of fill facilitates a particularly effective final stage of absorption that, as well as improving the organoleptic characteristics of the water produced, forms a large spectrum dam-like barrier against all undesirable substances that may otherwise slip through the preceding treatment stages.

FILTER BACKWASHING
Filter beds are periodically washed in order to maintain their efficiency; the lack of a pre-treatment water analysis makes it difficult to determine the necessary frequency of backwashing however, for water with average turbidity we can suggest the following operation times:

- For the sand filtration stage, the usual average interval between two successive washes of the same filter is about 16 - 24 hours.
- For the activated carbon filtration stage, given the particular nature of the treatment, and the quality of the already filtered water coming from the preceding treatment, an interval of 2 or 3 days could be suggested.

The filters are washed by reversing the direction of the water flow, from the bottom to the top, this captures any dirt trapped by the filter bed and conveys it to the disposal outlet, when the water at the disposal is virtually clear the operation is complete.

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3.7) Power Generator and Control Panel

As specified, we propose a power generator, diesel cycle with a robust control panel similar to that illustrated below:

Technical characteristics	DIESEL CYCLE
Quantity of Generators	1 (one)
Continuous power	KVA 4.6 - KW 3.7
Nominal tension	400V - 3 phase - 230V
Motor & Cooling System	Diesel motor, air cooled
Motor RPM	3000
Electric starter	12V
Fuel tank	20 lt
Noise LWA (db(A) at 7 m)	96 (71)
Dimensions	750 x 560 x 620 mm

Power Generator

Control Panel

Oner (1) Control Panel, stainless steel made, located in front of the unit, wired and linked with all the engine's command selectors and buttons, as illustrated above.

3.8) Plant Housing

The skid and housing in which the treatment equipment is mounted is made of Stainless Steel AISI 304, and are separate but easily coupled to the trailer supplied with an easy to use twist lock system.

The unit has the following characteristics:

Dimensions	2850 x 1200 x 1400 mm
Frame material	Stainless Steel AISI 304
Panel material	Galvanized carbon steel
Surface finish	White paint
Weather proofing	Against rain and dust

The skid, frame and panels come complete with:
- Treated connections for inlet, outlet, discharge
- Anchor system for fixing onto the trailer

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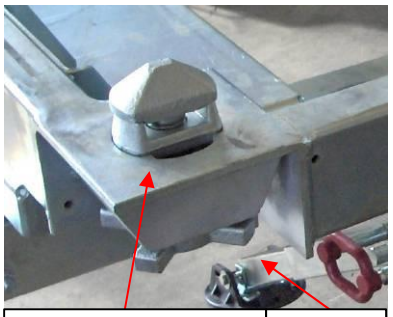
3.9) Trailer

As requested the EMS LAMELLA W CP 5/G SK unit will be supplied already mounted on a custom single axle with two (2) rear adjustable stands for stability when immobile.



Twist Lock for easy connection to water treatment unit.

Rear stands.

The "EMS Lamella " Unit + TRAILER have the following characteristics:

Width	1100 mm
Length	2850 +650 mm trailer hitch
Height	800 + 1400 = 2200 mm
Weight	Lamella Unit 850 kg
	Generator 180 kg
	Trailer 250 kg
Material	Galvanized carbon steel
Surface finish	White paint
Tyre type & size	Tubeless tyres size 195/65R15-14PR
Towing hook	UNIVERSAL HOOK with ADJUSTABLE HEIGHT (NATO specifications)
Ground clearance	> 180mm
Wheel base	NA, single axel trailers.

The trailer is designed with lockable storage compartments for accessories and spare parts.

Towing hook with adjustable height to allow for easy towing by a range of different vehicles.

Both socket hitch (left) and NATO standard ring hitch (right) supplied for maximum flexibility.

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3.10) Pillow ad water distribution

EMS water tanks are manufactured according to International Standards and where required are certified for use with drinking water. Instructions and repair kits come with every tank supplied.

All EMS Pillow Tanks are made of non-toxic reinforced polyester fabric which is UV, abrasion and puncture resistant. Joints are double welded for extra strength and durability and specific fabric weights (g/m²) are available upon request (standard g/m² tailored to capacity). Tank inlet and outlet fittings are available in different materials such as stainless steel and fibreglass reinforced poly-propylene.

In addition, the supply includes the installation of a piping system with flexible quick type fittings and a column with n. 4 taps

Quantity n. 1 (one) Capacity, size and weight 10,000 litres (10 m3) – 2,641 US Gallons

3.10) Operating Manuals

Each EMS LAMELLA unit will be supplied with clear instruction manuals for installation, filling, discharge and maintenance written in English.

3.11) Water Test Kit

The water purification unit will be supplied with a water quality analysis kit permitting operators to regularly and easily check the quality of the water produced:

One (1) Easy colorimeter test kit, complete with reagents for the simple check of the following analytical parameters:

- Turbidity

Total Dissolved Salts (TDS)

- pH
- Chlorine
- Iron

Aluminium

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