TECHNICAL SPECIFICATIONS and TECHNICAL OFFER

Contract Name: Renovating the public street lighting system and building an integral smart network in Cahul municipality

The rehabilitation and modernization of the street lighting system will be carried out in line with the volume of works under the execution project "Renovation of the public street lighting system and construction of an integrated intelligent network in Cahul, Zona Centru" from *Volume 2,* 10/03/2021-IEE*,* in compliance with the requirements of *energy efficiency* and *rules and standards in the area* with reference to relevant legal acts below:

ПУЭ – 7	Rules for the installation of electrical installations.
СТО 70238424.29.240.20.001-2011	Overhead voltage lines 0.4-20 kV. Requirements for production. Norms and requirements.
NCM C.04.02-2005	Natural and artificial lighting
Шифр 21.0112	Angle supports VLI 0.4 kV of a one-rack design on racks like SV105 and SV110
Шифр 26.0086	Single-circuit, double-circuit and transitional reinforced concrete supports VLI 0.38 kV with SIP-2A
ТП 3.407.1-150 СЭП	Grounding installations of the pillars
3.407.1-136	Issue 5 Pillars for outdoor lighting in rural areas. Materials for design and working drawings.
Шифр 21.0003	Suspension of self-supporting insulated VLI wires - 0.4 kV on existing reinforced concrete poles of 0.4 kV overhead lines with uninsulated wires.
NCM A.08.02-2014	Safety and health of construction work
NCM C.01.03.2015	Electro-technical installations
ГОСТ 28249-93	Short circuits in electrical installations
СП 51.13330.2011	Noise protection
СНиП 12-01-2004	Organization of construction
SM EN 13201-1 :2017	Public lighting. Part 1: Selection of lighting classes.
SM EN 13201-2 :2017	Public lighting. Part 2: Performance requirements
SM EN 13201-3 :2017	Public lighting. Part 3: Performance Calculation
SM EN 60598-1 :2016	Luminaires. Part 1: General requirements and tests
SM 300:2011	Reinforced concrete pillars for supports, supports of electrical and telecommunications networks, picket, cable networks. Technical conditions.

The respective document of technical specifications covers the technical requirements for manufacturing, supplying, testing and delivering the street light fittings using LED (electroluminescent diodes) technology, control, management and monitoring systems, cables, PCs, fixing elements and related accessories. The light fittings should be used for lighting the roads and the shared segments of roads.

In total, a number of 926 light fittings will be procured and assembled, being equipped with LED sources on exiting pillars and/or new pillars in line with the project documentation. The 926 light fittings shall be divided by different classes of the lighting system, as described below: with dimming system and tele-management - 838 fittings, and without dimming system and tele-management - 88 fittings.

The lighting fittings' performance should observe these technical specifications and may be tested so as to be assessed form their performance point of view. After installing and testing the light fittings, some of

them may be randomly selected to be sent to accreditation labs from EU to verify their compliance with technical parameters from this document of technical specifications. In this case, the payment for the light fittings will be made upon the reception of accredited lab's approval, before the expiration of the contract. The contracting authority shall be responsible for testing procedures' costs.

The approval in line with the respective specifications' document shall be obtained through one of the following or a combination of thereof:

1) Calculation-based evidence according to which a certain light fitting has equivalent or improved light performance capacities as compared to the level set in the specifications
2) Successful completion of the corresponding tests required in this specification by an independent and accredited testing authority
3) Provision of the test certificate from an independent and accredited testing authority based on an alternative specification, with test requirements that are at least equivalent with this specification.

1. List of equipment and works to be carried out under the present contract

Modernization of street lighting in Cahul municipality shall include at least the following works, which are necessary for normal operation of the street lighting system:

- Supplying and replacing the existing light fittings (especially the bulbs with sodium vapors / mercury vapors, etc.) by LED-type new lighting fittings according to the requirements specified in this document;
- Renovating and extending the public street lighting networks (including a segment of underground network), including electrical installation works at 0.4 kV according to the technical design;
- Automatizing the street lighting system;
- Supplying, installing and launching into operation the necessary control, management, and monitoring systems;
- Replacing the fixing elements, cables, etc. necessary for smooth functioning of the street lighting system;
- Demolishing / dismantling and assembling works under the contract conditions;
- Supplying, installing electronic meters for differentiated electricity tariffs (depending on consumption hours) for commercial metering, certified in the Republic of Moldova and approved by electricity provider for billing purpose, controllers with GSM / GPRS / RF / BT communication equipment or other equivalent communicator, and other necessary equipment to control the lighting intensity in different dimming regimes of LED devices;
- Supplying, installing, testing and launching into operation all the equipment set in these technical specifications;
- Ensuring the availability of all equipment, devices, tools, etc. for works specified in this contract;
- Supplying, handling and storing necessary materials and equipment;
- Supplying and installing a computer with corresponding parameters for monitoring, controlling and operating smoothly the lighting systems. The computer should be equipped with all necessary accessories, including the following: mouse, keyboard, flat monitor (IPS or equivalent matrix) with a minimum diagonal of 24 inch, UPS;
- Installing the necessary software to view all the necessary measures and parameters sent to the centralized monitoring point, and the CD with licensed software shall be sent to the Beneficiary;
- Performing photometric measurements with authorized personnel (specialized in lighting) to verify the lighting parameters obtained as a result of project implementation and observance of regulations imposed by lighting classes, in relation to the objectives for which the street lighting system has been implemented;

- The Contractor will measure the brightness and uniformity of the light before and after making the investment according to SM EN 13201-3 standard. The measurements will be carried out with specific equipment and certified personnel, by a lab with specific competences according to SM EN 17025 standard, accredited for measuring lighting devices' performance. The evidence shall be providing in the offer and namely the documents confirming the accreditation of the lab authorized for such measurements.
- Training the personnel of the contracting authority – a minimum number of 3 persons, for a minimum period of 24 hours regarding the practical use of the street lighting system.
- Other contract-related works.

The Bidder shall ensure the verification of all information in relation to its bid accuracy, taking into consideration all necessary elements for implementing correctly and fully the tasks, and including all consumables-related costs in its rates and prices, especially:

a) transportation costs;
b) handling, packing, loading, unloading, transit, supply, verification, insurance costs and other administrative costs related to the delivery; the packing is the property of the contracting authority, except for cases when otherwise provided in special conditions;
c) cost of delivery-related documents, when such documents are requested by the Contracting Authority;
d) costs for performing and supervising the mounting and/or launching into operation the delivered materials;
e) supply of necessary tools for assembling and/or maintaining the delivered equipment;
f) supply of detailed operation and maintenance manuals for each delivered equipment, as specified in the present document and Contract;
g) supervising or maintaining and/or repairing goods for a period of time, as specified in the Contract, noting that this service will not exempt the Contractor from any warranty obligation under the Contract;
h) training the personnel of the Contracting Authority at the premises of the Contractor and/or other premises, as specified in the Contract.

Since it is deemed that the Bidder determined its prices based on its own calculations, operations and estimates, it shall perform any work under any item of the bid for which no unit price or lump sum is indicated, without any additional fees.

The Bidder shall ensure a minimum level of quality: at least 5 years of warranty for performed works and supplied equipment under the Contact. It should be clearly specified (including by self-statement) that if over 10% of all equipment or any of its components breaks during the first year, the entire installed equipment shall be replaced fully, without any additional costs to be paid by the contracting authority for the respective operation.

2. General requirements for equipment

The technical-lighting calculations for road and pedestrian lighting should be made by an authorized specialist in the lighting area (an original-compliant copy of diploma shall be presented) and should guarantee the achievement of the following objectives:

- Ensuring the technical lighting levels that would have equal or higher values than those regulated in national and international standards and control parameters set in the technical design. These include the illuminance and luminance levels, general, longitudinal and transversal uniformities for illuminance and luminance, blindness threshold, etc.

- Ensuring a minimum level of electricity consumption, provided all the requirements are met through the following means:

- Lighting fittings with high efficiency and reduced maintenance costs, with high protection level, special optical characteristics, and equipped with LED source;
- The lighting system components shall be executed in line with the standards in force and will have conformity certificates;
- An extremely important aspect in relation to assessing the suggested technical solution will be the installed electrical power of lighting fittings used for modernization. This aspect will be calculated by every bidder on compulsory basis.
- It is also important to perform photometric measurements to verify the technical lighting parameters obtained after the implementation of the project and compliance with the standards imposed by the lighting classes, in relation to the objectives for which the respective public street lighting system was implemented. The testing reports shall be a component part of the Technical Book.

3.1 Technical and quality requirements for the lighting fittings

Nominal voltage

The lighting devices should operate under a voltage interval of: 198-242 V AC (single-phase);

The total electricity consumption by the lighting fitting with LED sources should not exceed the total consumption of guaranteed energy, including the consumption of energy in electronic circuits of the driver on the voltage interval 198-242 V. The fluctuations of the power lines will have no visible effect on the brightness intensity of the equipment with LED sources.

Nominal frequency

The lighting systems should operate on a frequency range of 50 ± 5 Hz.

Carcass

All the lighting fittings shall have a design adjusted to the LED technology, regardless of their form. Devices of retrofit type (reequipped/adjusted) shall not be accepted, meaning lighting devices developed for incandescent or discharging sources, which subsequently got adjusted for LED sources. The bids not observing this requirement shall be declared incompliant. The carcass from anti-corrosive alloys and light weight, such as, for instance, aluminum poured under pressure, sized to fulfill the function of a passive LED radiator, equipped with a system for regulating the angle of inclination within an action radius of 0 ...15^0. Plastic carcass shall not be accepted, and the use of ventilators and other mechanic devices shall not be allowed.

The carcass, including its optical component, shall be manufactured so as to avoid the penetration of water and dust, having a minimum protection degree of IP66 (with annexed testing report), with specific optics for street lighting system, manufactured from tempered glass. The situations of supply of lighting fittings with optical component from polycarbonate, even if it is UV stable (lighting fittings with optical component from polycarbonate shall be rejected) shall be avoided. As well, it should be possible to open easily the carcass, without using special devices. The color of the carcass shall be of metallic aluminum or it shall be painted in gray color with high resistance to corrosion.

Life span

Every light fitting shall have a minimum operation period of 100 000 hours, ensuring minimum 70% of the initial light output ratio. Assuming that every light fitting will function over 10 hours per night every day of the year during a period of 13.7 years, at temperature ranges of -35...+50^0C, it should meet all the

requirements set in these specifications. The bids not observing this requirement shall be declared incompliant.

Marking

Every light fitting should be marked accordingly. The isolation class should be labeled clearly. The marking should be applied on the internal part of the light fitting and shall cover minimum the following: manufacturer name, model number, production year, nominal voltage, nominal frequency, power of the light fitting, color temperature.

It is compulsory to indicate the type of light fitting and the manufacturer brand. The type of light fitting and manufacturer brand indicated in this way should identify themselves with the type of light fitting and manufacturer for which the requested conformity certificates were submitted.

Power factor

The light fittings should have a power factor ≥0.95

Harmonic distortion

Total harmonic distortions shall not exceed 8% from the grid connection point.

Electrical safety

Complete details shall be provided regarding any electrical protection devices (for instance, fuses, circuit breakers), which are part of the electrical safety system and will meet the national standards and rules and technical design documentation. Minimum protection against atmospheric discharges per fitting will be 10 kV, and protection against electric shock will be of class II.

Power cable and tele-management

Every light fitting shall be equipped with a power cable already connected to a driver and tele-management system. In this respect, the local controller, if supplied at the same time by the manufacturer, will be placed within the light fitting. In other cases, if controller is located outside the light fitting, the power cable shall be already connected in a way in which the connection of local controllers not to imply penetration within the fitting for performing the connection.

Light fitting driver:

- will be placed within the light fitting, meant for operating in outside environment and will have a minimum protection of IP65;
- will have a minimum life span equal or longer than the minimum operation period for a light fitting with LED sources;
- will have protection against overvoltage, protection against temperature exceeding the mentioned range, and protection against overload;
- will function in diminishing system on an interval of 100%-50%, with a maximum stage of 10% using power lines or wireless connections;
- will have terminals allowing connection to the diminishing standard 0-10V and/or PWM and/or Dali ;
- will ensure default 100% functioning of the light fitting, if the command systems or signal is lost;
- driver’s efficiency will be higher than 0.9 coefficient;

- brightness efficiency for the entire system (power, optical system, source) at 100% of dimming will be of minimum 140 lm/W. The bids not observing this requirement shall be declared incompliant.

Impact resistance

The level of impact resistance will be minimum IK08 (with testing report annexed.

Color temperature and index for color rendering

The light fitting shall have a range of correlated color temperature (CCT) of 4000 - 4500 K. Color rendering index ≥75.

Reliability

The Bidder should provide information about the reliability of the light fitting and performance of provided materials all over the operational life span of the light fitting in the specified use area and operation conditions for the light fitting.

The provided information will prove the reliability and performance assumed for the light fitting, including information regarding the failure modes and analysis of failures' effects.

Safety

Security technical file (MSDS) applicable for each light fitting or chemical ingredient of the light fitting, which is considered to be harmful for humans or environment in any way, shall accompany the technical documentation. If it is missing, it is considered that the light fitting fully complies with the standards, and is such risk emerges, the Bidder shall take full responsibility, including financial one, for protection people's health and environment.

Documentation for light fittings

- Conformity certificates/Conformity declarations issued by a certification body, accredited by the national/international accreditation body – signatory of EA – MLA for compliance evaluation for this category of products;
- Self-statement of conformity, issued by the manufacturer, proving that manufacturer has management systems according to ISO 9001 standard (quality management systems);
- Self-declaration of conformity issued by the manufacturer should be accompanied by test reports (IP, IK, EMC) issued by laboratories accredited in line with ISO 17025 standard for testing these categories of products;
- Every type of light fitting shall be accompanied by photometric test reports proving the efficiency of the light fitting of minimum 140 lm/W in the interval 198-242V, 50±5Hz, operation temperature of – 35...+50^{0}C;
- The warranty certificate issued by the manufacturer with a minimum guarantee of 5 years in conditions of light fittings' and related equipment operation according to the set conditions. The Contractor should provide a warranty for works of minimum 5 years;
- Declaration from the manufacturer / bidder specifying directly that in case of failure/break during the first year of operation of more than 10% of installed equipment, all other similar equipment shall be dismantled and replaced by other equipment at its own expense;
- The technical file/catalogue page shall be provided for the light fitting in Romanian, Russian or English, covering as well the photometric curve of the light fitting. The photometric curve of the light fitting should meet the parameters requested for the brightness class attributed to the site for which financing is requested;

- Photometric calculation shall be provided for every presented situation, fulfilled by the specialist in lighting area (the copy of the diploma shall be presented according to the original). For verification purposes, the .ltd and/or /ies files of the light fitting shall be provided, as well as the file with total technical lighting calculation (equivalent to Dialux Evo file);
- EC marking applied and/or ENEC certification.

Specific requirements for submitted test reports

- The test reports issued by laboratories accredited in line with ISO 17025 standard for testing these categories of products. The minimum requirement is to submit reports developed in line with SM SR 60598-1 standard "Light fittings Part 1. General prescriptions and tests" covering at least:
    - Marking;
    - Construction;
    - Internal and external cabling;
    - Protection grounding;
    - Protection against electrical shocks;
    - Resistance to dust and humidity for solid fittings
    - Resistance to insulation and dielectric rigidity;
    - Flashover distance and air breakthrough distance;
    - Durability and heating;
    - Resistance to heat, fire, and formation of conductor ways;
    - Terminals;
    - Resistance to mechanic impact (IP, IK);
- Photometric test reports for the entire light fitting, issued by an ISO 17025 accredited lab with minimum conditions:
    - Bulletins should include values of luminous intensity in the transverse plane ($I_{transversal}$ [cd], for γ^o- in at least 10 positions) and longitudinal ($I_{longitudinal}$ [cd], for $C_{90°}$ and $C_{270°}$);
    - Submission of photometric curves in rectangular and polar coordinates, submission of isocandela diagram for every provided product;
    - Measuring bulletins for the entire light fitting: Initial light output ratio, Ra, Tc.

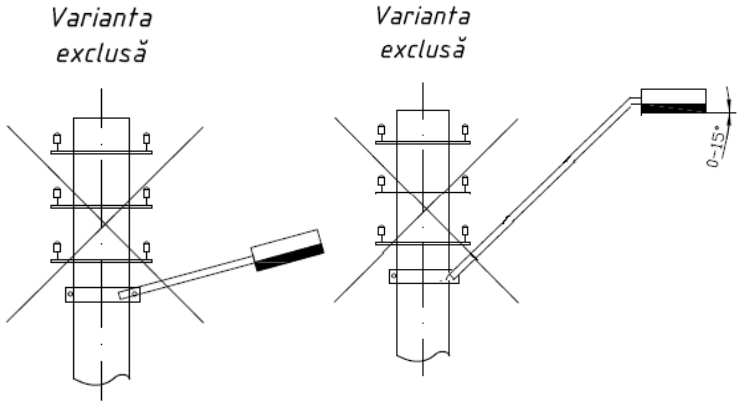
If test reports are submitted without requested minimum information (test report on 1 page, without full information about the product and manufacturer sending the product for testing), the contracting authority reserves itself the right to declare the respective bid as incompliant

3.2 Minimum technical requirements imposed for consoles and fixing clamps:

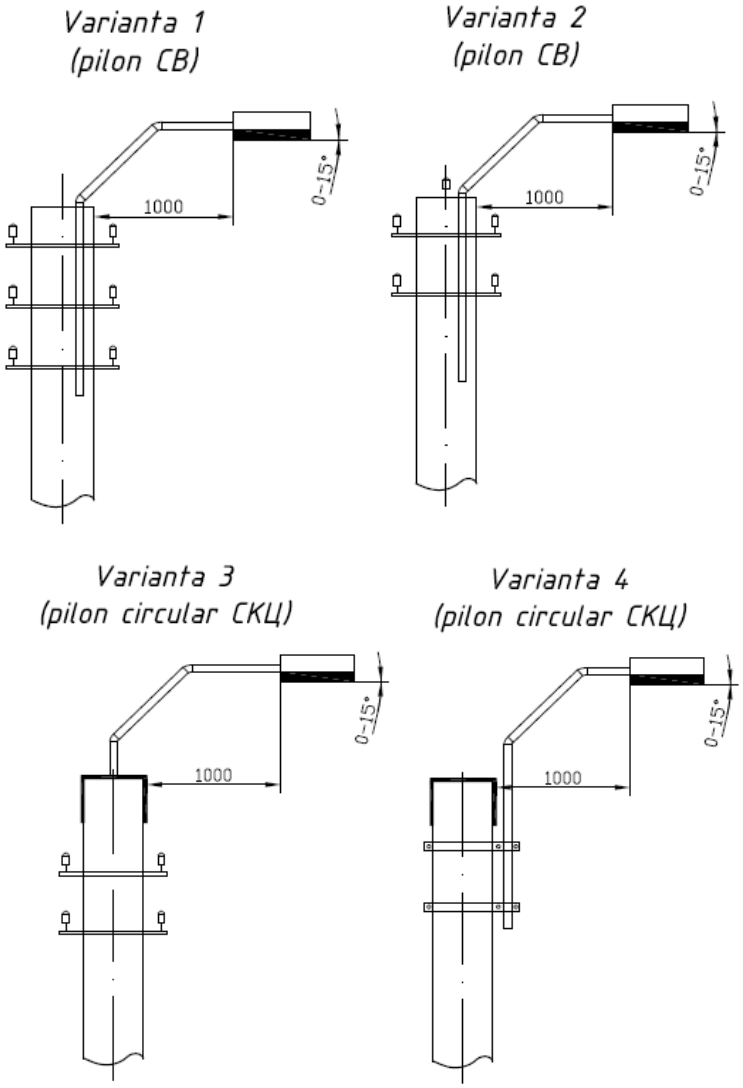
- Any console (except for those placed on galvanized metallic pillars) will be fixed on the pillar with the help of clamps with the characteristics indicated below.
- The consoles will have a minimum length of 0.5 m, respectively a maximum one of ¼ of the assembling height. It is recommended for the maximum length of the consoles not to exceed 1.5 m. The reason for applying this standard intervenes in the context of ensuring an uniform architectural aspect for the locality. At the same time, the focus will be on supplying consoles of similar design.
- The fixing elements should be supplied, installed together with all the necessary materials to ensure high quality lighting and necessary level of brightness and operation of the street lighting system.
- Material: painted steel pipe with minimum diameter ø42mm for light fittings with a weight equal or less than 7 kg and minim ø60mm for wright over 7 kg.

- The fixing on pillars shall be performed in pair with screws, if the installation is on the length of the pillar and pre-manufactured fixing elements if the installation is on the upper part of the pillar.

The bidders shall present the **representative** model of suggested consoles / fixing clamps. Next 2 models of fixing clamps shall be excluded from bids.



An **example model** for presenting the technical design of the fixing clamps is specified below.



The following shall be submitted on compulsory basis:

- conformity certificate for the pipe with D42-60 mm
- Bidder's solid commitment to manufacture consoles according to the mentioned sketches and to use fixing clamps to fix them.

The bids not observing this requirement shall be declared incompliant

3.3 Minimum technical requirements imposed for grid connection cable

- Self-supported insulated conductor 0,6/1 kV 3x25 AL/54,6
- Nominal voltage U_0/U: 0,6/1 kV
- Minimum temperature of environment (on the cover): -25^0C
- Maximum admissible temperature on the conductor: 90^0C
- Testing voltage: 3kV

The following shall be submitted on compulsory basis:

- conformity certificate
- technical file / catalogue file of the cable in Romanian, Russian or English

3.4 Minimum technical requirements imposed for grid connection clamps

- Derivation clamp with teeth for public lighting *LEA-JT 95-25/70-25 mm^2* for grids with bunched conductor.
- Carcass material: synthetic.
- Material/Section of the main conductor: Al/95-25.
- Material/Section of the secondary conductor: Al/70-25.
- Type of conductor: circular compact.
- Nominal voltage U_0/U: 0,6/1 kV.
- Material maximum voltage: 1,2 kV.
- Supported voltage, embedded, at industrial frequency: 6 kV.

3.5 Minimum technical requirements imposed for pillars:

Reinforced concrete pillars

Pillars from reinforced concrete, trapezoidal model, pre-stressed for supporting electrical grids – SET 9.5-2

Pillars from reinforced concrete, trapezoidal model, pre-stressed for supporting electrical grids – SET 10.5-5

Pillars from reinforced concrete, centrifuged, for supporting electrical grids - CK-16.1-1.3

Table 3.5.1. Technical requirements for pillars

Pillar brand	Cross-section form	Length of pillars, m	Calculated bending moment, kNm	Quantity of material used for pillar, brand	
				Concrete, m3	Steel, kg
Set 9,5-2	SE – pillars for trapezoid air electrical grids (T)	9,5	2,0 (19,6-20)	0,3 B25 (M300) / F100 / W4	28,8

Set 10,5-5	SE – pillars for trapezoid air electrical grids (T)	10,5	5,0 (49-50)	0,47 B30 (M400) / F100 / W4	55
CK-16.1-1.3	centrifuged pillars for overhead electrical networks (CK)	16,4	16,0	1,317 B40 (M400) / F150 / W6	-

Construction requirements

- The nominal thickness of the protection layer of concrete down to the active (pre-stressed) casing should be 20 mm;
- The welding of grounding conductors with the head of the active casing should ensure their secure connection;
- The ends of the pre-stressed casing should not exceed the frontal areas of the pillars for more than 10 mm, except for the head of the casing equal to 50 mm, where the grounding conductor is welded;
- The ends of the pre-stressed casing and superior frontal part of the pillar should be protected from corrosion with protection paint in 2 layers, with protection materials by painting items operated in atmospheric conditions;
- The quality of surfaces and the appearance of pillars should meet the conditions SM 300:2011;
- The concrete of delivered pillars should not have cracks, except for cracks of superficial local contraction and other technological cracks of maximum width of 0.1mm;
- Assembling ears should be cleared of concrete;

Figure 3.5.1. Pillar 9,5-2

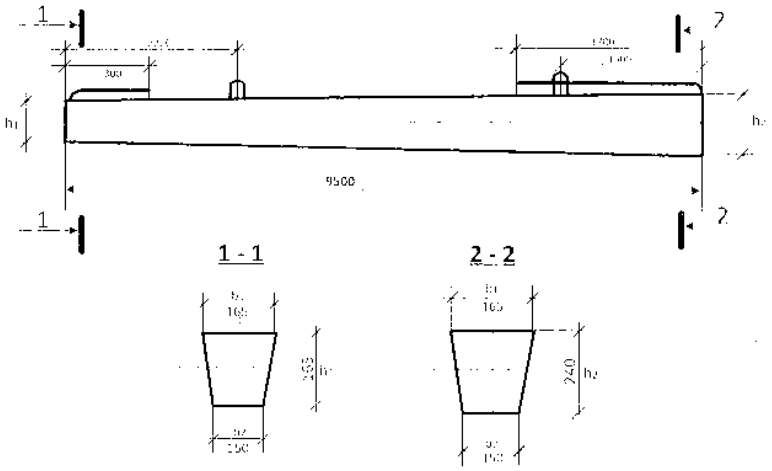
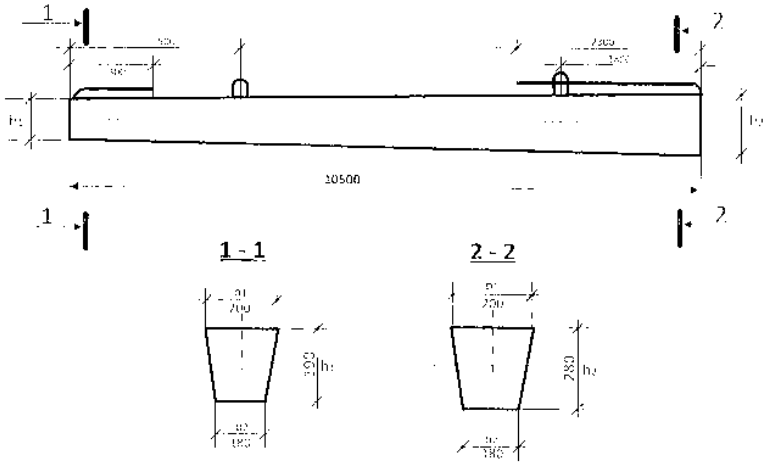


Figure 3.5.2. Pillar 10,5-5



3.5.2. Reliability requirements for pillars

Pillar brand	Control loads, P, minimum kN			Bending control arrow, maximum mm
	Mechanic resistance	Rigidity	Resistance to cracks	
SET 9,5-2	3,4	2,4	1,9	400
SET 10,5-5	8,9	6,3	5,3	400

The following shall be submitted on compulsory basis:

- Conformity certificate issued by an accredited body ISO 17025
- Technical documentation, including technical file and test reports

Metallic pillars

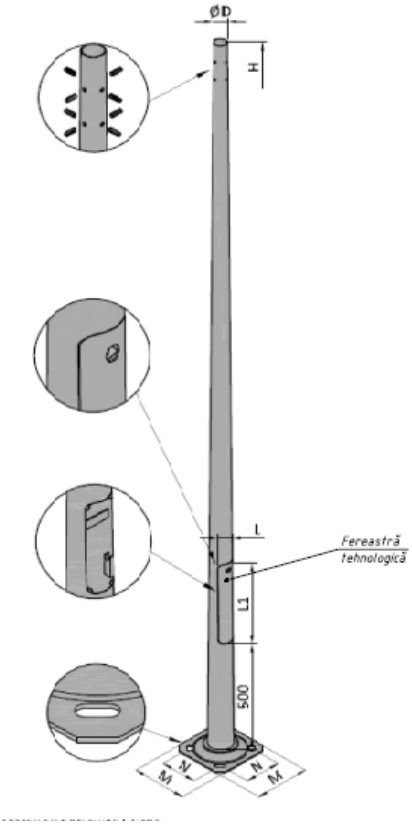
Technical parameters of metallic pillars included in the design shall, at least, meet the following equivalent requirements

Pillar	**Height**	**Weight**	**Wall thickness**	**Diameter**	**Size of technological window**	**Sole size**	**Foundation type**
	m	**kg**	**mm**	**mm**	**mm**	**mm**	
Metallic pillar equivalent CC 6m 62/146/4	6,0	74	4	62	100x500	410x300	FP2
Metallic pillar equivalent CC 7m 62/160/4	7,0	92	4	62	100x500	410x300	FP2
Metallic pillar equivalent CC 8m 62/174/4	8,0	109	4	62	100x500	410x300	FP2

Model of metallic pillar equivalent CC 6 (7,8) m 62/146 (160,174)/4

The following shall be submitted on compulsory basis:

- Conformity certificate issued by an accredited body ISO 17025
- Technical documentation, including technical file and test reports



3.6 Minimum technical requirements imposed for the dimming and tele-management system

General considerations

The entire lighting system created in Cahul municipality will be managed remotely, regardless of the fact if a dimming program is or not applied for installed light fittings. In this respect, the remote management of the system means that the Bidder will present a SCADA-type management system, which will be used, with access to internet, and saving the accumulated information on local server (provided by bidder).

The created lighting system will cover 15 management / transformation points fully equipped on bidder's responsibility, regardless of the fact if the equipment is indicated or not in the technical specifications, will all necessary devices for good operation. Such equipment includes, but does not limit itself to: zone controller, equipment for connecting to internet, equipment for accessing internet, safety system for such equipment, meter, switchers, warning system for door opening. It is very important for the switch cabinets to be equipped with a secured opening system, at least key and individual locks (the installation of standard switch cabinets which may be opened with the same keys shall be excluded), due to placing in such cabinets of costly equipment which needs higher level of protection and safety.

Table 3.6.1. General data regarding type of light fittings and their maximum power divided by flash points

	Site type	No. of fittings	100W zebra	20W	30W	40W	50W	60W	80W	150W	Architectural pillar with LED fitting 50W, with no dimming system
1	Pt-434	92	9		33	27		23			

	Site type	No. of fittings	100W zebra	20W	30W	40W	50W	60W	80W	150W	Architectural pillar with LED fitting 50W, with no dimming system
2	PT-2	81	3		13	27	12		14		12
3	PT-3	79			69	10					
4	PT-18	66	3			25					38
5	PT-91	65	2		35	23		5			
6	PT-97	100	4	10	37	17	12	20			
7	PT-98	47			10	37					
8	PT-92	73	3		34	36					
9	PT-102	105	8		26		37	14		8	12
10	PT-101	21	8		1		2	8		2	
11	PT-22	73	7		30	7	9	7	13		
12	PT-21	26			26						
13	PT-14	29	2		8	6	13				
14	Pt-19	22			16	6					
15	PT-107	47	1			4	10			6	26
Total		**926**	**50**	**10**	**338**	**225**	**95**	**77**	**27**	**16**	**88**

Minimum components of the dimming and control system

- Electronic meter for electricity, for commercial metering, certified in the Republic of Moldova and approved by the electricity provider for billing purposes, which would allow scanning the parameters through dimming and remote management solution, in line with local and/or international standards. The meters should have the option of applying differentiated tariffs depending on consumption hours;

- Zone/group control devices sending data to the web application by using mobile data networks and communicate with individual control devices, in line with the rules based on which the respective technology has been developed, in license-free frequencies or via wire. Minimum 100 individual control devices will be allocated to each group control device. The zone control device will be provided with non-volatile internal memory to save its own data and the data collected from the individual control devices for minimum 48 hours, in case the communication with the web application is interrupted or the power supply is disturbed;

- The individual control devices, allowing the individual command and control of light fittings, control the light fitting according to the operational profiles defined at the level of group or individual logic (minimum): switched on/off (via internal relay), reducing brightness intensity (dimming), as well as individual monitoring through key parameters: voltage, current, power factor, temperature, consumed power, number of functioning hours; individual control element controls the electronic source of the light fitting with LED via command interfaces 1-10V and/or PWM and/or DALI. They use at least the communication protocol 1-10V and/or DALI, for the new light devices to be able to be equipped with such communication devices, regardless of their producer; allowing control for reducing the light flow down to a preset threshold; are equipped with additional exit to control power supply (switched on/off) for light fittings and have the possibility to register locally consumed electricity based on a meter.

- This equipment should be installed in new cases / cabinets protected by painting or manufactured from metal, with restricted access.

- Server with necessary accessories (mouse, keyboard, monitor, UPS), equipped with operation system on which management systems are installed (applications, software, etc.) and where the collected information will be stored. The server will have specific size and will allow collecting and storing minimum accumulated information over the next 5 years since the final acceptance of works. The bids shall be deemed as incompliant if they provide for storage of information in CLOUD, even if they provide free of charge or fee-based subscription for a minimum period of 5 years. All information needs to be stored on the server, regardless if this needs to use and/or operate a system on the CLOUD. All the costs of hardware and software elements necessary for saving the information represent the responsibility of the bidder, who should indicate them in the bid. After acceptance, the contracting authority shall pay no additional payments during the warranty period of the system for any maintenance actions. The corrective maintenance actions, emerged as a result of deficient use of the system by the Beneficiary shall be covered by the Beneficiary.

- If the GSM network for data transmission is used for collecting the information from the zone controllers, the Bidder will provide the system of internet subscription for installed modems for at least 5 years, for all the zone controllers. Server's access to internet will be provided by the contracting authority, through a broadband internet connection with fixed public IP and with the permission to make VPN connections; the Bidder having the responsibility to set the parameters for the server for assimilation of information from the zone controllers.

- Web application, including Mobile Responsive (will operate without errors at least through such browsers as: Google Chrome and/or Firefox and/or Microsoft Edge), being in Romanian, Russian or English and allowing: graphic display of bright spots and of zone/group control devices on a map in GIS system or on a non-preferential map (3D recommended); real-time follow up of system status and consulting the data recorded by the system; setting up the system on a tree-like structure, including such levels as: city, district, street, bright spot. Bids shall be deemed as incompliant if they cover subscription to an application, even if the subscription is provided for 5 years. After acceptance, the contracting authority will not pay anything additional over the duration of warranty period for the tele-management system, for its maintenance or support, except for situations when application development services are requested and corrective maintenance actions are necessary.

- System use guide. When the system is suggested in English (Romanian and/or Russian is recommended), the use guide shall be provided in Romanian and/or Russian.

Technical and functional parameters:

A. Zone/group controllers

- ensure control and decentralized monitoring of lighting system;
- allow remote control and monitoring of individual control elements (light fittings), via low voltage electricity circuits for supplying power to light fittings;
- set through specific software application, allowing defining in its own database of light fittings the following parameters: nominal voltage, nominal current, nominal power, minimum power factor, type of control interface for individual control element, light fitting operation duration, maintenance factor, etc., as well as geographic coordinates (latitude, longitude, elevation) of every individual control element (light fitting) and of the concentrator. The application ensures settings' synchronization for individual control elements from the application with those from every individual control element, programming and reprogramming the operational profiles of light fittings, for different timetables, depending or not on the astronomic calendar, sending warnings to IP addresses or URL addresses, ensuring the monitoring of all light fittings, (this being individually tackled) and displaying the following parameters: voltage, current, power

factor, temperature, consumed power, number of functioning hours, energy consumption. The application should allow the following manual commands: switching on/off and reducing the brightness flow;
- software application – for graphical display of bright spots and data concentrator based on geographic coordinates (latitude, longitude, elevation) assigned to every individual control element and concentrator, on the map - Google Maps or equivalent;
- real-time clock, with energy reserve, which may be synchronized in time.

B. Individual controllers:
- operates in online mode and stand-alone mode, in case the connection with data concentrator gets interrupted, without losing the information regarding consumed energy;
- can be addressed and programmed individually and firmware updatable, via data concentrator;
- may be programmed individually, if it is not integrated in the network, or before integration, through a specific hardware and software device;
- DOO (Dimmed ON/OFF) ensures progressive increase of light output when switching on and progressive decrease of light output when switching off; the function is accessible in stand-alone mode;
- ISD (Intelligent Switching Time Dimming) ensures the functioning of the light fittings, for minimum 5 dimming levels, on different timetables, by learning in relation to the duration in which the light circuit is powered, after 3 days of operation. The function is accessible in stand-alone mode;
- MFF (Maintenance Factor Function) ensures the compensation of light output ratio depreciation of the light fitting over the period of its operation, ensuring constant light output. This function also allows permanent use of a certain power installed on the lamp which is smaller than its nominal power, if a smaller light output than the nominal one is necessary in the field to obtain the necessary technical light results; the function is accessible in stand-alone mode and online via data concentrator.

C. Control and tele-management system in general
- sending remotely the commands by using last generation technology based on standardized communication protocols, of open type. No communication technologies belonging to one single producer („proprietary technology”) for which a use/development license is necessary shall be accepted;
- possibility to access the web application by any pre-defined user in the system, from any terminal connected to internet (allowing WEB browsing)and minimum protection of connection with password and user name;
- collecting data in a centralized way from the group controllers, using mobile data networks (GPRS/GSM or UMTS) or Ethernet
- graphic representation of every control device / light fitting and its condition on a map, depending on its GPS coordinates;
- representation of logics in a tree-like structure, which would cover at least the following levels:
- country level,
- city level with belonging zones,
- locality level,
- street level,
- bright spot level
- switching on/switching off/reducing light output at the level of light fittings, according to the conditions imposed through preset operation programs, which may be modified in the user interface at any moment, upon the request of the beneficiary, including after assembling the light fittings;

- dynamic change of light output (according to preset programs, defined by the beneficiary), which would allow reducing the light output with different shares as compared to the nominal light output, based on specific timetables, day-night duration or other predefined conditions;
- operation, if needed, through manual orders, which will be sent, at least, from the bright spot level to the city level and group level (working group), in "real time " (response time in the field of maximum 5 minutes; in the data interface will be updated in maximum 30 minutes and instantly in case of need);
- easy programming and reprogramming, any time it is necessary, of some energy-saving operation profiles for public lighting, for different timetables, defined by the beneficiary, including the future streets/traffic zones, temporary or long-term events, fests, etc.;
- allows configuration of at least 10 different working groups (operation scenarios), to which any of existing light fittings may be allocated in tele-management system, depending on used application;
- working groups (and control devices allocated to them) defined for different operational scenarios, will not be conditioned by belonging to a certain zone control device or by the configuration of the power supply grid;
- every working group allows at least 2 operation scenarios, defined depending on week days (1 scenario for working days and 1 scenario for weekends).
- interface will allow defining in advance some special days during the year with different operational scenarios as compared to the rest of the year, for every working group separately (e.g.: Easter, Christmas, City Day, etc.)
- knowing remotely the condition of the public lighting system regarding the: status of the light fitting / condition of control device, status of group control device, dysfunctionalities in operation;
- knowing remotely at least the following electrical and operational parameters at the level of light fitting/device:
  - absorbed electricity,
  - supply voltage,
  - electric current intensity,
  - cos ϕ,
  - energy consumed at the level of individual control device,
  - number of hours the control device operated,
  - condition of existing communication between the control device of the light fitting and the group control device,
  - condition in which the light fitting is – switched on/switched off/manual mode/automated mode,
- automated interrogation of control devices and storing historical data, to be used in subsequent reports, should be carried out at an interval of at least 90 minutes, and the data of “real time values” type should be displayed at an interval of at least 30 minutes.
- in case of an accident (interruption of electricity supply to local and zone control devices), the tele-management system should be operational in maximum 5 minutes and should send data in the system in maximum 15 minutes; the operation should be ensured for a minimum regime of 24 hours.
- permanent and, upon request, monitoring, sending reports through e-mails to the predefined beneficiaries in the system;
- defining the users depending on the allocated roles by the system administrator (system viewing, configuration of equipment, configuration of operational profiles, viewing functioning reports, etc.);
- issuing reports and the possibility to export data at least in a compliant format „.csv” and „.pdf”, according to the system administrator requests
- control device will be able to control and monitor consumption for loads of at least 0W-1100W for max. 4A la λ=0,8 afferent to it, these may be also the cumulated consumptions of the public light device + festive lighting or of projects related to the architectural lighting;

- the system should be scalable, should allow adding in future other control devices/light fittings, without additional costs, besides the hardware components and connection to mobile telephone network or Ethernet of the zone control devices;

The contractor should supply and install the server, with necessary accessories (mouse, keyboard, flat monitors). At the same time, it is the task of the bidder to determine the necessary equipment and services to create a control system and to manage remotely the suggested lighting system. The implemented system should be fully functional, the delivered internet subscriptions should be paid for at least 5 years ahead and need to determine a sufficient traffic volume for ensuring continuous functionality in normal operation conditions.

To ensure full operation of the management and control system, the bidder will submit the certificates and declarations or other proving documentation for the equipment, which would include, at least:

- clear description of the entire system and tasks it would be able to assimilate, which cannot be less than the ones indicated in the present documentation
- every control panel should have a scheme with readable legend / acronyms;
- conformity certificates / conformity declarations under their own responsibility for equipment provided within the dimming system;
- use manuals in Romanian and/or Russian languages for control application and tele-management, and for metering application;
- Technical specifications;
- Operation warranty for minimum 5 years.

3.7 Technical requirements imposed for carrying out the technical-lighting calculations:

- a global maintenance factor of MF=0.85 shall be used in the calculation, in compliance with the technical characteristics of the light fitting;
- the technical-lighting calculations performed for the bid on witness streets shall consider the carriageway according to the witness situations in the present documentation;
- the technical-lighting calculations shall be performed in line with the provisions of the standard SR EN 13201;
- the technical-lighting calculations shall be performed either with a neutral program recognized by the CIE (International Commission on Illumination), or with a program certified by an international or national body accredited by CIE – for instance Dialux EVO.
- the minimum values for the lighting classes will be in line with the witness situations in the present documentation;
- the task to develop a photometric calculation using the dimming system is not covered in the current technical specifications.

3.8 Binding conditions for submitting the technical offer

- Signed and stamped technical files will be submitted for each type of equipment requested in the technical specifications, which will contain a column with the requirements of technical specifications and a column with the characteristics of offered equipment.
- The characteristics of the offered equipment should meet fully or to be higher than the requested ones.
- The bidders' statements may be proved by submission of conformity certificates or other endorsed documents that should indicated the declared statements.
- The conformity certificate for, at least, the following equipment: light fittings, diodes, control and management equipment, meters, cables, wires, switcher, overvoltage stoppers, etc.;

- Producer's testing certificates (IP level, reliability, safety etc.)
- The above-requested documents shall be submitted on minimum totality on binding basis. The failure to submit the above-requested documents leads to declaring the bid as incompliant.
- Meeting the above-mentioned minimum technical requirements is binding; failure to meet them leads to disqualification of the respective bids.
- If the technical-lighting parameters of a situation is not met, the bid will be disqualified from technical point of view.

The bidders not submitting the technical files or those who do not meet the minimum requirements of equipment requested in the technical specifications shall be disqualified.

The winning bidder will have the duty to obtain the necessary endorsements and approvals in line with the legislation in force. Local Public Administration of Cahul municipality and the project team will provide all the necessary assistance in this respect.

The bidder will firmly commit itself to observe the proposed implementation program. The detailed implementation program will be developed by the contractor and agreed with the contracting authority after signing the contract.

If being awarded the contract, the bidder will closely work with the project team and will be appointed independently by technical site supervisor – Certified Technical Manager in the fields of "Electrical installations and networks" and "Automation installations" and will provide him/her all necessary information for fulfilling his/her activity. If being awarded the contract, the bidder will closely work with the Cahul Mayoralty support team which will perform independent visits for quality control.

3.9 Technical specifications for LED lamps, Fixing elements, Control and management system, Software

The eventual submitted documentation should indicate clearly (point out, mark) the offered models and included options, if needed, for the evaluators to see the exact configuration.
The bids which do not allow precise identification of equipment models and specifications may be rejected by the evaluation commission.
The bid should be sufficiently clear to allow the evaluators to make a clear comparison between the requested specifications and offered specifications.

For details and drawings, please consult the technical part submitted in volume 2 10/03/2021-IEE

1. **No.**	**2.** **Requested specifications** For details and drawings, please consult the technical project
1.	**LED light fittings**
	Producer
	Model/year of production
	Minimum efficiency level: at least 140 lm / W for the light source;
	Power factor: > 0,95;
	IP: 65 or better for electrical components (attaching the test report);
	IP: 66 or better for optical components (attaching the test report);
	Nominal voltage: 198-242 V AC (on single phase);
	Nominal frequency: 50 ± 5 Hz;
	Lumens' projection: not more than 10% of the nominal level of lumens is projected at over 80 degrees from the vertical and 2.5% from the nominal level of lumens is projected at over 90 degrees from the vertical;

1. No.	2. **Requested specifications** For details and drawings, please consult the technical project
	View angle: not less than 120 degrees;
	Life span of the light fitting: at least 100 000 hours with insurance of at least 70% of initial light output.
	Marking: every light fitting should have a label internally with the following minimum information: isolation class, manufacturer, model / year, power system / power / voltage LED, ID numeric code
	The driver of the light fitting: should have the dimming function from 100% to 50% with a step of 10% using the power line or wireless connection.
	Light color: 4000 - 4500 K;
	Drivers: should have protection against fluctuations in voltage, protection against overvoltage, protection against temperatures and protection against overload;
	Driver efficiency: >0,9;
	Anti-vandal protection: at least IK08 (test report should be attached);
	Carcass: from anti-corrosive alloys and light weight, such as, for instance, aluminum poured under pressure, sized to fulfill the function of a passive LED radiator, equipped with a system for regulating the angle of inclination within an action radius of 0 ...15^0.
	Optics should be made of secured glass
	CRI (color rendering index): at least 75 or more.
	Reliability: information to be provided regarding the reliability of light fittings and performance of materials offered for the operational light life span for specified scope and operational conditions; supplied data should prove reliability and performance for provided light fittings, including information about failures/breaks and analysis of failures.
	Total harmonic distortion: (%) <8%.
	The bidder should offer adjustable fixing spigot, according to the technical design with at least 4 contact points;
	Working temperature: -35 °C to + 50 °C.
	Temperature for storing light fittings: -10 °C to + 45 °C for at least 24 months.
	• Producer's warranty for at least 5 years; • Warranty for works for at least 5 years; • Photometric curve: depending on the light class attributed to the street; • Valid certificates of LED producer: ISO 9001; • Certificate issued by a body accredited by a national accreditation body – signatory of EA - MLA for this type of activity; • Conformity declarations under own responsibility issued by producer should be accompanied by test reports (IP, IK, EMC) issued by labs accredited in line with ISO 17025 standard for testing these categories of products; • Every type of light fitting will be accompanied by photometric test reports proving the efficiency of the light fitting of minimum 120 lm/W in the interval 198-242V, 50±5Hz, operation temperature – 35...+50^0C;

<table>
<tr><td>1.
No.</td><td>2.
Requested specifications
For details and drawings, please consult the technical project</td></tr>
<tr><td></td><td>

Producer’s certificates / declarations or other regarding the reliability of materials and carcass (light fitting), energy-saving life cycle, application mode and serving conditions;
Declarations from producer / bidder specifying that is during the first year of operation, more than 10% of installed equipment fails, all similar equipment will be dismantled and replaced by other at the expense of the bidder;
EC marking applied and/or ENEC certification;

Provided information should prove the requested reliability and performance for offered light fitting, including information about the accident modalities and analysis of effects.
<table>
<tr><th>№</th><th>Power of the light fitting, W</th><th>Quantity, pieces</th></tr>
<tr><td>1</td><td>20</td><td>10</td></tr>
<tr><td>2</td><td>30</td><td>338</td></tr>
<tr><td>3</td><td>40</td><td>208</td></tr>
<tr><td>4</td><td>50</td><td>112</td></tr>
<tr><td>5</td><td>60</td><td>77</td></tr>
<tr><td>6</td><td>80</td><td>27</td></tr>
<tr><td>7</td><td>100W for crosswalks</td><td>50</td></tr>
<tr><td>8</td><td>150W</td><td>16</td></tr>
<tr><td>9</td><td>Architectural pillars with 2 LED fittings 50W</td><td>88</td></tr>
<tr><td colspan="2">Total</td><td>926</td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>Fixing elements</td></tr>
<tr><td></td><td>Material: painted steel pipe with a min diameter of ø42 mm for light fittings with a wright less or equal to 7 kg and min ø60mm for weights higher than 7 kg;</td></tr>
<tr><td></td><td>Sizes: depending on street geometry, maximum length will not exceed ¼ of assembling height</td></tr>
<tr><td>3.</td><td>Control and management system</td></tr>
<tr><td></td><td>Hardware requirements:
Scanning frequency data from the electronic meter. The systems should scan the following data:
1. Voltage on power supply
3. Current
4. Power
5. Condition of cabinet door (open / closed)
6. Instant consumption
7. Cumulative consumption
8. COS fi</td></tr>
<tr><td></td><td>Possibility to store all data minimum from one week (in absence of GSM);</td></tr>
<tr><td></td><td>Availability of an autonomous calendar operating without external supply with a possible synchronization with the central server SCADA.</td></tr>
<tr><td></td><td>Communication with server through GSM or RS-48;</td></tr>
<tr><td></td><td>HMI presence (manual local setting);</td></tr>
<tr><td></td><td>Electronic meters for electricity at differentiated tariffs (depending on consumption hours) for commercial metering, certified in the Republic of Moldova and approved by electricity provider for billing purposes</td></tr>
<tr><td></td><td>Possibility to download the lighting program locally and from the server;</td></tr>
<tr><td></td><td>Operational temperature -20 to + 50 C;</td></tr>
<tr><td></td><td>IP: min 57;</td></tr>
<tr><td></td><td>Battery capacity: min. 48 hours;</td></tr>
<tr><td>4.</td><td>Software</td></tr>
<tr><td></td><td>Capacity to store the database: min 6 months;</td></tr>
<tr><td></td><td>Reading the data via Internet;</td></tr>
<tr><td></td><td>Possibility to archive the data;</td></tr>
<tr><td></td><td>Graphic mode: digital map with transformation points (TP) displaying the information about their condition;</td></tr>
<tr><td></td><td>Possibility of remote control for every TP;</td></tr>
</table>

1. No.	2. **Requested specifications** For details and drawings, please consult the technical project
	Min 3 access levels: admin, shift supervisor, operator;
	Remote monitoring;
	Possibility to review the database in the table and in graph, with the possibility to filter information. Minimum number of parameters – 50 pieces;
	Warning signals, informing responsible persons via SMS, e-mail, and graphic display of operator on screen
	Availability of emergency situation logs;
	Communication with server via GSM or RS-485 or better.
	Personal computer • Accurate parameters for monitoring, control and smooth operation of lighting systems. • Accessories: mouse, keyboard, flat monitor (IPS or equivalent matrix) with diagonal size of minimum 24 inch, UPS.
	Other, if necessary

NOTE:

Attached technical design documentation is provided for information purpose. The original technical design documentation will be sent to the winning bidder after signature of the contract. The technical offer is developed based on above-provided technical specifications (quantity and quality of necessary equipment and materials).