**Terms of Reference**

**of the Consultancy Services for Design of canals and laterals canals, project documentation and specifications under Project “Rehabilitation of Irrigation and Drainage” Project "Advisory services for Implementation of Component C”**

**"Enhancing Monitoring and Data Automation"**

 **(KAZ-0082)**

1. Background.

The Republic of Kazakhstan has received a loan from the Islamic Development Bank (hereinafter referred to as the “Bank”) to finance the design of canals and drainage channels, project documentation and specifications within the framework of the Project “Restoration of irrigation and Drainage” under the Project "Consulting services for the implementation of Component C” "Improving the efficiency of monitoring and data automation" in the amount of 89,250 US dollars.

1. Project Objectives

The Project Objective is to ensure control over the level of water consumption and its regulation by agriculture in the Turkestan region. As part of the implementation of this project, the reconstruction of gauging stations on certain canals of the Turkestan region will be carried out with the introduction of automated water metering systems, which will increase the efficiency of obtaining data on water consumption and reduce the error in irrigation water consumption.

1. Criteria for Selecting Project Locations

Irrigation water is transported to the canals mainly by non-pressure traffic along the Inter-Republican Canal "Dostilik" with water intake from the Syrdarya River on the territory of the Republic of Uzbekistan. Automation of water metering and regulation will be carried out in accordance with Appendix No. 1 at 25 branches from the Dostilik canal and at 4 pickets of the K-21 canal. Due to the fact that the canals have a non-pressurized movement, a retaining structure is used on all canals to ensure the water velocity.

1. Project Description.

Irrigation water is transported to the canals mainly by non-pressure traffic along the Inter-Republican Canal "Dostilik" with water intake from the Syrdarya River on the territory of the Republic of Uzbekistan. Automation of water metering and regulation will be carried out in accordance with Appendix No. 1 at 25 branches from the Dostilik canal and at 4 pickets of the K-21 canal. Due to the fact that the canals have a non-pressurized movement, a retaining structure is used on all canals to ensure the water velocity..

Project activities are grouped into following components:

A. Сarrying out design and survey work for the development of design and estimate documentation

B. Approval of design and estimate documentation in RSE "Gosexpertiza"

С. Author's supervision of the project implementation`

1. Project Stakeholders.

The Republican State Enterprise "Kazvodkhoz” (KVH) will be the Executing Agency (EA) for the Project. Project Management/Implementation Unit (PMU/PIU): A PMU has been established in Astana.

Technical supervision: International Centre for Biosaline Agriculture (ICBA) is coordination and technical supervision of project implementation and Strengthening of the data processing service and improving efficiency.

1. The Objective of the Consultant for Engineering Design and Construction Supervision

Through the IsDB loan, "Kazvodkhoz" intends to attract a design organization (Сonsultant) for engineering design and author supervision of construction and implementation of automated water metering systems. A Сonsultant with relevant experts with experience in relevant projects should assist in the development of detailed design and supervision of construction, installation, testing and commissioning, environmental protection, monitoring of guarantees and provision of reports on the progress of work on quality. The Consultants will ensure that the Project is completed in accordance with the work schedule and the required quality standards within the budget.

1. Scope of Consulting Services

Irrigation water is transported to the canals mainly by non-pressure traffic along the Inter-Republican Canal "Dostilik" with water intake from the Syrdarya River on the territory of the Republic of Uzbekistan. Automation of water metering and regulation will be carried out in accordance with Appendix No. 1 at 25 branches from the Dostilik canal and at 4 pickets of the K-21 canal. Due to the fact that the canals have a non-pressurized movement, a retaining structure is used on all canals to ensure the water velocity.

Phase-1. Preparation of detailed design, cost estimate and bidding document.

The consultant conducts the necessary surveys, assessments and to prepare a complete set of working (design) documentation necessary to prepare Bidding documents, including engineering estimates (EE). Expected activities will include but are not limited to the following:

1. The Consultant is responsible for development all detailed engineering designs in accordance with the government standards necessary to complete the work;
2. The consultant must obtain positive opinions (expert opinion) from the Gosexpertiza and permits for the developed project, as well as from all other government authorities, and the consultant must ensure coordination between various structures and departments.
3. The consultant should include in the project any alternative design solutions that can offer the best technical and economic solutions without deviation from local standards and building codes;
4. The Consultant shall base its design documentation on proven technology and established design and construction practices. All relevant backup copies of documents must be provided by the Consultant;
5. The Consultant shall ensure that all aspects of project design comply with the national legislation and international codes and standards.
6. The Consultant shall ensure that only the most recent versions of the preliminary design documents and drawings are used in the execution of the detailed design documents;
7. The Consultant shall be responsible for correcting any drawings or documents found to be incorrect due to insufficient field checks, errors or omissions on the part of the Consultant. In this case, all technical changes made during the construction period will be made at the expense of the Consultant;
8. The Consultant shall liaise with the PMU and other parties to complete all anchor points with existing facilities and include them in drawings and documents related to this project;
9. The Consultant shall perform all necessary calculations and carry out all relevant design and analysis procedures necessary to optimize the dimensions and selection of equipment, if any, and material specifications;
10. The Consultant shall provide all necessary technical drawings, data sheets, specifications, bill of quantities, cost estimates and guidelines to complete the work;
11. The detailed design and estimate documentation must be prepared in four (4) copies at each facility/sub-project and in a digital version on CD, which will be handed over to the Client. The explanatory note must be in MSWord format, evaluation tables must be made in MS Excel format, and drawings - in Auto CAD and PDF format. The Client must review and confirm the work performed by the Consultant;

A detailed scope of work is attached (Appendix No2).

The Consultant shall be guided by local construction regulations and design codes (design standards) approved by the legislation of the Republic of Kazakhstan and government regulations in the field of construction and other regulatory documents. Standards show the content and execution of drawings, detailed documents shall be prepared by the Consultant. The content of the drawings should include the following:

-source data;

-introduction;

- basic technical and technological solutions;

- technical and economic indicators;

-Application;

- working drawings of the object;

- A summary list of the needs of the main building materials, products, structures and equipment approved by the customer;

- technical regulations;

- design documentation;

-software;

-Concepts;

- functional diagrams;

- Structural diagrams

- External wiring diagrams

- Equipment layout plan;

- Cable log.

- Summary list of cables;

- Custom specifications;

- wiring diagrams;

- Operator's manual

- Work organization plan.

- rules for the operation of the canal, taking into account the automated water metering system.

PHASE-2: Author's supervision of construction and installation works

The Consultant will assist the Client in the supervision activities during the (i) construction period and (ii) defect liability period.

Conducting athor supervision of construction and installation works

Consultant will fully manage the construction process through proper author supervision of construction and installation works, which will begin immediately after the signing of the contract between the Employer and the Contractor. The Consultant should always maintain sufficient and experienced staff on the construction site, with a clear distribution of responsibilities, supervise the daily progress of construction and installation works.

Expected activities during the supervision phase will include, but are not limited to:

* The Consultant shall develop a methodology for conducting construction supervision, evaluating contractor performance, and reporting to Client.
* Provide construction supervision, including supervision of contractors to control construction quality and equipment installation (as per the design), delivery time and cost in the whole period of construction, as well as during the defect liability period;
* The Consultant shall plan and verify the final pre-commissioning tests carried out after the completion of each construction package;
* The Consultant shall view all contractual documents, drawings and notify the Client about inconsistencies / shortcomings and take all necessary corrective actions with the approval of the Client;
* The Consultant shall call and/or attend all meetings necessary to manage and provide services required for project activities, including periodic meetings with contractors to review progress, and to prepare and distribute copies of the agenda and meeting records, support PIU in supervising all construction works to ensure quality of works as per technical specification, drawings, and condition of contract using modern and computerized systems of project monitoring;
* assistance in establishing a process for third party inspections;
* attend third-party inspections, if required, and provide certification on the quality of the supplies based on such inspections;
* monitor construction and quality control methods, certify that quality of works conforms to the specifications and drawings, assess the adequacy of the contractors’ inputs in material, labor and construction method, and furnish all revisions and detailed drawings as necessary during the continuance of the contract;
* establish a Quality Assurance and Quality Control plan and manage its implementation including quality assurance procedures, schedule of quality conducting periodic “quality meetings” to maintain approved quality standards;
* perform inspection of the contractor and supplier's work for conformance with the contract and purchase order documents;
* generate a non-conformance report in case of any non-conformance (the non-conformance report to be verified & recorded);
* ensure suitable and sufficient quality tests are performed of materials and equipment (the results of the tests to be documented in conformance with the specific requirements of the contract documents);
* additionally, carry out independent tests as necessary, as and when desired by the PIU, for quality assurance of the works at contractor’s own cost;
* maintain completed records of all test results including suppliers’ material tests;
* review and approve the test results/certificates and wherever tests indicate lack of conformance, initiate action to secure conformance including additional tests as considered necessary to establish quality of the work desired;
* note deficiencies in the contractor and supplier's work, cause corrections to be made, and check the remedial work and facilitate to rectify the deficiencies as per national standards;
* ensure that various products’ guarantees used in the works are available for sufficient period;
* conduct monthly technical quality audit in co-ordination with PIU.
1. Environmental and Social Mitigation Management Plans (ESMP) Requirements

The Consultant shall:

* ensure the contractor implements site-specific Environmental and Social Mitigation Management Plans (ESMP), and Resettlement Plans in accordance with IFI guidelines..
* advise on mitigation measures, provide technical support, and conduct environmental training to the staff of the contractor and assist the contractor in preparing site specific ESMPs. Update ESMP as required and review updated ESMP and confirm that mitigation measures have been included in reconstruction and civil works and equipment installation;
* conduct training / orientation and briefing of all workers and visitors in this regard.
1. Completion

The Consultant is responsible to:

* ensure the master snag/punch lists and the check-out tests for facilities and systems (tests will be observed and/or approved by the PIU or its representative at its discretion: the PIU and all consultants may also contribute to the final snag/punch lists);
* arrange for, coordinate and verify the contractors’ or suppliers’ corrections, modifications and adjustments, if any, to equipment and systems prior to final handing over of each facility or system to the satisfaction of the PIU and/or operating staff;
* make a final inspection and list the defects to be rectified prior to issuing of final completion certificate;
* recommend to the PIU to issue completion certificates after the contractors and suppliers have satisfactorily completed all work;

Managing defect liability period

The Consultant will evaluate the defects on the delivered construction projects during the defect liability period, including, if necessary, issuing all notices of defects to the contractor. The Consultant will coordinate, verify and issue a Certificate of Completion at the end of defects liability period in accordance with the terms of the contract. The tasks of the Consultant will cover, but not be limited to, the following:

* Conduct post-construction inspection of works and facilities for each contract and certify to the Employer the start date of defects liability period, which are expected to be at least 12 months after acceptance of the works;
* To control the provision to the Client at the completion of the construction contract by the Contractor of a complete copy of the as-built documentation, which fixes any changes in the original working documentation;
* Inspect the works during defect liability period and assist the Client in the proper completion of the construction as well as the closing of the contract.

The stipulated period for the development of design estimates is 30 (30) working days in total. The time period for construction work is 12 months, including twelve (12) months of defects liability period.

1. REPORTING AND DELIVERABLES

The Consultant will report to the Client’s nominated representative on all aspects of the Assignment.

The Consultant will provide deliverables addressing in detail all tasks as specified in Section 7: Scope of Work, meeting the deadlines for the submission of works, as well as any other tasks which can be foreseen by a professional consultant to be required to achieve the Objectives of the assignment as defined in this ToR. Unless otherwise agreed, all deliverables and documents will be in Russian language and submitted electronically (MS Office and PDF editable format) with the final versions of the submission and also in a hard copy, if requested so by the PIU. The documents to be issued in the role of the Engineer are to be issued in accordance with the relevant contracts and guidance in the table below is an indication of additional requirements to those indicated in such works contracts for the Engineer.

All Project reports issued by the Consultant shall be reviewed and approved by the PIU. A period of two weeks shall be allowed for the review and approval.

The Consultant will provide the Client and the IsDB with information, designs, data and documentation through submission of periodic reports prepared during the course of its service or specific reports prepared at the request of the Client. In addition, the Consultant will prepare and maintain full and proper records of all meetings and discussions.

The Consultant will timely provide at least the following Deliverables and Reporting:

|  |  |  |  |
| --- | --- | --- | --- |
| Deliverable | Draft submitted | Final submitted | No. of Printed issues in Russian  |
| Phase-1. Preparation of detailed design, cost estimate and bidding document |
| Inception Report. | Mobilization + 2 weeks | 1 week after the comments provided | 1 |
| Full Design documents  | During 30 working days from the commencement of services | 1 week after the comments provided | 1 |
| **PHASE-2: Athor**'s **Supervision of construction and installation works** **(for each sub-project)** |
| Engineer’s Work Programmed Report |  | Within 28 days of issuance of the Engineer’s consent to the Contractors’ Work Programmed | 1 |
| Contracts Monthly Progress Reports analysis | Monthly | 1 week after the comments provided | 1 |
| Quality Management Plan | Within 28 days of the works contract signature | 1 week after the comments provided | 1 |
| IPCs | Monthly, unless the works contract provides for a different timing | 1 week after the comments provided | 2 |
| Take-Over Certificate | Within 7 days of receipt of Contractor’s request | Within 21 days of receipt of Contractor’s request | 1 |
| DNP report | Within 14 days after DNP expiry | 1 week after the comments provided | 1 |
| **General Reporting**  |
| [Ad-hoc report](#_5.2_Monthly_Progress)s | According to the timeline specified in the request for such report, except for the accident reports to be provided within 3 working days from the date of an accident without a request to this extent | 1 week after the comments provided | 1 |
| [Quarterly Progress](#_5.3_Quarterly_Progress) Reports | Within 10 working days of end of a reporting period | 1 week after the comments provided | 1 |
| [Project Completion](#_5.4_Project_Completion) Report | On Project Completion | Within 2 weeks of receiving the Client’s comments | 1 |

1. QUALIFICATION REQUIREMENTS

The Consultant must have the following permits from state authorities to provide services, in accordance with the legislation of the Republic of Kazakhstan:

1) Availability of a license of the no more 2nd category for project activities with the following subtypes of activities:

 - Construction design (with the right to design for major repairs and (or) reconstruction of buildings and structures, as well as reinforcement of structures for each of the following works) and construction, including:

* 1. bases and foundations;

concrete and reinforced concrete, stone and reinforced masonry structures;

2) Availability of a license for the design of engineering systems and networks, including:

- internal systems of low-voltage devices (telephone, fire and security alarm), as well as external networks;

3) Availability of a license for technological design (development of the technological part of construction projects) of industrial facilities, including:

- for the energy industry.

4) Availability of a license for the performance of work and the provision of services in the field of environmental protection with the following sub-type of activity:

- Environmental design, standardization for the 1st category of economic and other activities.

5) Availability of a license for licenses of the 1st category for survey activities with the following subtype of activity:

- Engineering and geodetic works, including:

- topographic works for design and construction (surveys at scales from 1:10 000 to 1:200, as well as surveys of underground utilities and structures, tracing and surveying of surface linear structures and their elements).

6) Certificates:

- ISO 9001 – Quality Management System

- ISO 14001 – Environmental Management System

- ISO 45001 – Occupational Health and Safety Management System

- ISO 50001 - Energy Management Systems

The Consultant shall provide a sufficient number of qualified and experienced personnel to ensure the proper preparation of detailed design, construction supervision and engineering services, both during the construction period and during the defect liability/maintenance period. To ensure the timely execution of the Works and the efficient use of financial resources, the Consultant shall maintain a permanent presence of its Key Personnel at the construction site until construction is completed and all major facilities are put into operation. The Consultant's personnel shall consist of key, non-key and support personnel.

The need for staff for consulting work, as indicated above, is estimated as follows:

**1st Phase (preparation of project documentation, detailed design)**

|  |  |  |
| --- | --- | --- |
| **Position** | **Q-ty of experts** | **Total M/M** |
| **Key Experts** |
| K1- Project Chief Engineer  | 1 | 6 |
| K2 – Senior Civil Engineer | 1 | 6 |
| K3 – Environmental Engineer | 1 | 6 |
| K4 – Metrolog | 1 | 6 |
| K5 – IT specialist  | 1 | 6 |
| Total Key Experts | 5 | 30 |
| Non-Key experts\* |
| NK9 – Quantity Surveyors | 1 | 6 |
| Total Non-Key Experts | 1 | 6 |

\*However, the amount of experts may vary according to the volume of works.

2nd Phase (Project authors supervision period )

|  |  |  |
| --- | --- | --- |
| Position | Q-ty of experts | Total M/M |
| Key Experts |
| K1- Team Leader / Project Chief Engineer / Chief Architect | 1 | 14 |
| K2 – Senior Civil Engineer | 1 | 14 |
| K4 – Environmental Engineer | 1 | 14 |
| K5 – Health and Safety Specialist | 1 | 14 |
| Total Key Experts | 4 |  |
| NK13 – Construction Supervision Engineers | 8\* | 36 |
| Total Non-Key Experts | 8 | 288 |

\*However, the amount of experts may vary according to the volume of works.

The Consultant has the opportunity to suggest additional professional experts that it deems necessary to hire for the successful completion of the assignment. The Consultant is expected to provide sufficient support staff to complete the assignment (AutoCAD specialist, technical specialist, topographer, surveyor, translator, secretary, office manager, driver, etc.).

Qualification requirements for personnel

Key experts

The Project Chief Engineer must have

• Higher education (in the field of automation and control). Supporting documents: a copy of the diploma of higher education (including bachelor's degree).

* Availability of a certificate of an engineering and technical worker of the chief engineer of the Projects, with a validity period covering the period of implementation of the Project.
1. **Ecologist** with the following qualifications
* Higher education (in the field of ecology). Supporting documents: a copy of the diploma of higher education (including bachelor's degree):
* Availability of a certificate confirming the completion of advanced training courses in the field of ecology.
1. An estimator with the following qualifications:
* Higher education (in the field of industrial and/or civil engineering). Supporting documents: a copy of the diploma of higher education (including bachelor's degree):
* Availability of certificates confirming the completion of training in the use of the ABC software product.
1. **Main Metrologist** with the following qualifications:
* Higher education in the specialty "Mechanical Engineer" Supporting documents: Availability of a copy of the diploma of higher education (including bachelor's degree):
* Availability of a Certificate confirming the completion of training in the requirements for the competence of testing and calibration laboratories.
1. **Specialist** in setting up and installing automated systems with the following qualifications:
* Higher education in the specialty "Electric Power Engineering". Supporting documents: a copy of the diploma of higher education (including a bachelor's degree):
* A certificate confirming the completion of training in the basics of programming SIMATIC S7 controllers.

**APPENDIX 1**

Requirement for Design

The design includes the development of design and estimate documentation with the receipt of a positive conclusion of the state expert

1. Requirements for architectural, construction, space-planning and structural solutions

Architectural and construction, space-planning and structural solutions in the design of objects shall meet the requirements of the current regulatory documents in the field of architecture and urban planning in the territory of the Republic of Kazakhstan.

When designing, if necessary, provide for the reconstruction of gauging stations (concreting of the measuring section of the canal, replacement or reconstruction of the gauging bridge, etc.).

1. Requirements for the implementation of development and research work

In accordance with the requirements of the norms in force on the territory of the Republic of Kazakhstan.

1. Requirement for the installation of automated water metering systems at head gauging stations

The envisaged automated water metering system should provide water measurement in an open channel using ultrasonic sensors. Sensors must be able to be removed for cleaning and replacement without changing the previously installed configuration. The installation of sensors should be designed so that sedimentation does not interfere with the ultrasonic pathway, silt and rocky scree can be removed without difficulty, signal transmission cables cannot be damaged by debris, rocks or other materials, fish hooks, boat anchors, ice.

Characteristics of Ultrasonic Sensors

 Measurement of water flow velocities in the range from 20mm/s to 12m/s

 Version not lower than IP68;

 Depth measurement from 20mm to 5000mm

 The error is not more than ± 5%;

 Operating temperature -40 to +60 °C;

 Automatic generation of archives of data on measured water volumes;

 Mode of operation - continuous;

 Integrated control with local LCD display, with protection against unauthorized access at the local software level;

 Each measuring point must be provided with a transmission for programming, displaying, and storing data.

1. Requirements for installation of automated water metering and distribution systems at K-21 canal pickets: PK45+00, PK95+00, PK123+29, PK 148+58

An automated gate should be able to measure and regulate water flow and include built-in water level sensors, a motor drive, a gate position sensor, water flow rate sensors, remote control capability, and a backup power supply. An automated shutter must meet the following requirements:

Shutter Specifications

 Shutter material: metal with anti-corrosion properties;

 Ultrasonic/hydrostatic measurement of water level;

 Measurement of water flow velocities, including low ones from 20 mm/s;

 Design: not lower than IP68;

 Automatic generation of archives of data on measured water volumes;

 Integrated control with local LCD display of the controller built into the gate or control cabinet, with protection against unauthorized access at the level of local software;

 The local software and hardware complex should provide manual and automatic control of the shutter according to the following parameters:

1) Automatic movement of the shutter to the set position;

2) Ensuring a constant set flow rate, if it is possible to provide the necessary amount of water by the supply channel.

3) Self-diagnostics of the condition of the gate actuator to ensure timely preventive maintenance;

4) the possibility of remote control and monitoring from the control room, if necessary;

In the event of a power failure, the mechanism of the system shall be able to manually open and close the shutter.

The physical principle of flow measurement should be based on the method of the difference in the transit time of the ultrasonic signal.

The measuring scheme should consist of several levels.

A sufficient number of flow meters should be provided to ensure a measurement error of no more than ± 2.5%.

The software must be able to visualize the received signal.

Ambient temperature range not less than -20°C to +60°C.

* 1. Media Requirements

Communication with the central control center, which will be located in the central office of the RSE "Kazvodkhoz" in Astana, should be possible through one of the following communication channels:

a) GSM (using VPN tunneling);

b) Secure radio channels.

c) LAN

* 1. Requirements for the description of the data transmission medium

The selected equipment must support one of the standard communication protocols: ModbusRTU, ModbusTCP, ModbusACSII, Ethernet, 2G, 3G, 4G or any other standard open communication protocol.

The manufacturer of the selected equipment is obliged to provide a description of the data transfer procedure with a description of the data transfer protocol between the secondary converter and the server, both at the physical and software level, for subsequent implementation in the centralized information system.

* 1. Requirements for the provision of power supply to measuring areas

Calculate power consumption and voltage, as well as ensure power supply in accordance with SN RK 4.04-07-2019 based on the sum of one-time capacities, taking into account the inrush currents of the following systems:

a) Continuous flow measurement;

b) Regulation of water flow at the head facilities

c) Continuous operation of the rest of the auxiliary and telecommunication equipment;

In the absence of power lines at the proposed site of installation of automated water metering and distribution systems, provide alternative sources of electricity with the capacity required for continuous operation based on the sum of one-time capacities, taking into account the starting currents of the following systems:

a) Continuous flow measurement at intervals of no more than 1 time every 600 seconds;

b) Regulation of water consumption for at least 24 minutes a day in the absence of power supply in the network;

c) Telecommunication equipment with a data transmission frequency of at least 3 times a day;

d) Continuous operation of the rest of the auxiliary equipment.

* 1. Dispatch System Software Requirements

In order to ensure the real-time operation of systems for collecting, processing, displaying and archiving information about the object of monitoring or control, it is necessary to ensure integration with the SCADA system at the local, regional and central levels.

The SCADA dispatch control system is designed to maintain operational primary water metering and operational control of the water flow regulation process. The subsystem of operational dispatch control should solve the following main tasks:

The operational dispatch control system should perform the following functions:

• accounting of water management facilities and their technical characteristics,

• registration and accounting of control and measuring devices and places of their installation,

 • registration of calibrated data by measuring points,

 • accounting and maintenance of reference books and classifiers,

 • accounting of control parameters of water bodies,

 • display of primary water metering indicators,

 • collection, transmission and processing of information,

 • control over the water level, discharge, position of gates of the relevant hydraulic structures,

• registration, maintenance and control of gate control schemes,

• input and accounting of data on the study of water samples taken at sampling points,

• monitoring of equipment power supply parameters, • generation of an event log and a system log,

• generation of archival information,

• detection and alarm of exceedances of control and alarm parameters,

• system configuration.

The SCADA information security system is designed to perform the tasks of information control and protection, data reliability control, and information loss protection.

The information security system should perform the following functions:

• diagnostics of SCADA system elements by levels,

• control and differentiation of access to SCADA,

• control of data reliability in the process of information transfer (protection against distortions and losses),

• protection of information from unauthorized and unintentional deletions and corrections, protection of information from losses in case of an emergency.

* 1. Requirements for the control room

It is necessary to install and equip dispatch points in the Maktaaral and Zhetysay production sites of the Turkestan branch of the RSE "Kazvodkhoz". To ensure the transmission of information in real time to the control centers of the Turkestan branch of the RSE "Kazvodkhoz" and the Central Office of the RSE "Kazvodkhoz"

1. Requirements for the safety of information in case of accidents

In case of loss of operability due to failures, errors or failures of software and hardware, the System must provide a 100% guarantee of information safety.

The Rules of Procedure of the System provide for the creation of backup copies of databases and related information. The backup process should be automated with minimal operator functions and a user-friendly window interface.

The safety of information in the system should be ensured in the following emergency situations:

• disruption or failure of communication channels;

• complete or partial failure of the system's hardware, including failures and failures of hard disk drives;

• failure of general or special system software;

• errors in the work of personnel;

• failure of the complex of technical means due to man-made accidents – damage to external communication channels, disruption of the power supply system of the building, damage to the water supply system of the building, etc.;

• failure of an element of the system's network infrastructure;

• Single server crash Failure of a single server disk array server disk failure;

• server processor failure;

• server memory bank failure;

• Failure of the server's network adapter failure of the internal power supply of the server;

• violation of the logical integrity of the information stored on the server disk;

• Power supply failures of the following types:

 voltage drops – short-term decreases in case of a sharp increase in the load in the electrical network;

 high-voltage pulses – significant short-term voltage increases;

 Complete power outage – complete power outage due to accidents, overloads;

 Too much voltage – a short-term increase in the voltage in the network; voltage frequency instability.

1. Energy Saving Requirements

In accordance with the requirements of the norms in force on the territory of the Republic of Kazakhstan

1. Requirement for protection against acts of vandalism

When developing a section in order to prevent and prevent damage and damage to integrity, it is necessary to provide solutions for the protection of elements and equipment of automation and power supply from acts of vandalism, such as:

 fencing structures from unauthorized access of people and animals;

 Introduction of anti-award tickets; Availability of video cameras;

 Installation of warning signs "Video surveillance is in progress" in the places where the equipment operates, painting devices in special colors in order to warn the population about the status of increased danger and the importance of this object;

 alarms for unauthorized opening and violation of the integrity of elements and equipment of automation and power supply.

1. Construction and installation works

Construction and installation works include the reconstruction of gauging stations and installation sites for automated water metering and distribution systems (described in ANNEX 1).

Construction and installation works must be carried out in accordance with the design and estimate documentation and the norms of the legislation of the Republic of Kazakhstan.

Hydrometric bridges are auxiliary structures. They are built in gauging sites to perform various hydrometric works from them and provide pedestrian communication between the banks. In this regard, bridges are used not only by hydrometers, but also by the population, which imposes special requirements on their design, namely: bridges must withstand loads arising from household factors (groups of people and even from domestic animals), i.e. they must have a significant margin of safety, which would not be required if the bridges served only hydrometric purposes. In these conditions, in order to reduce household loads and lighten, and therefore reduce the cost of gauging bridges, they are built as narrow as possible, with a width of 0.8-1.4 m, which is quite enough for hydrometric work. In the design of bridges, it is customary to distinguish two large components: the superstructure and the supports. The superstructure, connecting the banks of the water body, provides a bridge ....

1. Special Construction Conditions

The seismicity of the area should be accepted in accordance with the requirements of SNiP RK 2.03-30-2006. Work to be carried out in the conditions of an operating enterprise

**APPENDIX 2**

**LIST OF IRRIGATION CANALS FOR AUTOMATION**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **Branch** | **Channel name** | **Channel type** | **Channel type** | **Head canal** | **District name** | **Total length, km** | **Throughput** | **Suspension Area, ha** | **Top Width** | **Bottom width** | **Depth** | **Latitude**  | **Longitude** |
| 1 | Turkestan | K-11 | Inter-farm channel | lined | Dostyk | Maktaral | 7,8 | 1,5 | 1 991 | 5 | 0,8 | 1,2 | 40\*37'02.24 | 68\*38'42.94 |
| 2 | Turkestan | K-13-3 | Inter-farm channel | lined | Dostyk | Maktaral | 23,773 | 5 | 5 182 | 7,3 | 3 | 1,55 | 40\*38'47.25 | 68\*35'26.54 |
| 3 | Turkestan | K-13-6 | Inter-farm channel | lined | Dostyk | Maktaral | 23,773 | 5 | 5 182 | 7,2 | 2,5 | 1,4 | 40\*38'46.47 | 68\*35'27.91 |
| 4 | Turkestan | K-13A | Inter-farm channel | lined | Dostyk | Maktaral | 3,54 | 1,5 | 1 126 | 4,2 | 1,2 | 1,2 | 40\*40'36.00 | 68\*32'12.06 |
| 5 | Turkestan |  K-15 | Inter-farm channel | earthy | Dostyk | Maktaral | 16,2 | 6,5 | 6 253 | 15,3 | 5,5 | 3 | 40\*43'04.45 | 68\*27'40.55 |
| 6 | Turkestan | K-16B | Inter-farm channel | earthy | Dostyk | Maktaral | 31,04 | 1,5 | 1 458 | 8,5 | 6,3 | 1,9 | 40\*38'16.28 | 68\*36'32.93 |
| 7 | Turkestan | K-17 | Inter-farm channel | earthy | Dostyk | Maktaral | 14,855 | 6,5 | 5 144 | 11 | 4 | 2,3 | 40\*44'04.03 | 68\*25'49.41 |
| 8 | Turkestan | K-18 | Inter-farm channel | earthy | Dostyk | Maktaral | 26 | 12,5 | 11 393 | 12,8 | 5,5 | 3,5 | 40\*40'46.67 | 68\*31'55.97 |
| 9 | Turkestan | K-18A | Inter-farm channel | earthy | Dostyk | Maktaral | 16,69 | 1,2 | 777 | 5 | 2 | 1,8 | 40\*40'27.39 | 68\*32'34.00 |
| 10 | Turkestan | K-21-1 | Inter-farm channel | earthy | K-21 | Maktaral | 761 | 3,30 | 2312467 | 4,30 | 0,80 | 1,30 | 40\*45'24.01 | 68\*12'07.50 |
| 11 | Turkestan | K-21 | Inter-farm channel | earthy | Dostyk | Zhetysay | 29,1 | 23,1 | 19 812 | 18 | 12 | 3,7 | 40\*45'36.96 | 68\*21'50.95 |
| 12 | Turkestan | K-21B | Inter-farm channel | earthy | Dostyk | Zhetysay | 16,2 | 1,5 | 747 | 6,6 | 1,6 | 1,7 | 40\*47'43.53 | 68\*19'18.25 |
| 13 | Turkestan | K-22 | Inter-farm channel | lined | Dostyk | Maktaral | 11,7 | 5 | 3 470 | 13 | 4,5 | 2,8 | 40\*44'16.51 | 68\*25'30.55 |
| 14 | Turkestan |  K-23 | Inter-farm channel | earthy | Dostyk | Zhetysay | 18,607 | 2,5 | 882 | 10 | 2 | 2 | 40\*49'52.97 | 68\*17'12.99 |
| 15 | Turkestan | K-23A | Inter-farm channel | lined | Dostyk | Zhetysay | 8,93 | 1,8 | 1 322 | 6,5 | 2 | 2,1 | 40\*49'55.98 | 68\*17'10.02 |
| 16 | Turkestan |  K-25 | Inter-farm channel | earthy | Dostyk | Zhetysay | 34,026 | 13 | 11 662 | 16,5 | 7,5 | 3,1 | 40\*51'02.10 | 68\*16'12.85 |
| 17 | Turkestan |  K-25-9 | Inter-farm channel | lined | K-25 | Zhetysay | 5.8 | 2.00 | 2497.00 | 7.55 | 2.55 | 1.4 | 40\*52'30.55 | 68\*07'55.83 |
| 18 | Turkestan |  K-26 | Inter-farm channel | lined | Dostyk | Zhetysay | 13,74 | 6 | 6 226 | 8,3 | 2,6 | 1,89 | 40\*47'04.93 | 68\*20'00.88 |
| 19 | Turkestan |  K-27 | Inter-farm channel | earthy | Dostyk | Zhetysay | 5,293 | 1,2 | 705 | 10,5 | 3,5 | 2 | 40\*52'42.51 | 68\*14'49.01 |
| 20 | Turkestan |  K-28 | Inter-farm channel | lined | Dostyk | Zhetysay | 18,1 | 11,95 | 10 800 | 12,8 | 5 | 2 | 40\*50'27.63 | 68\*16'47.15 |
| 21 | Turkestan |  K-30 | Inter-farm channel | lined | Dostyk | Zhetysay | 42,8 | 20 | 12 800 | 11,8 | 5 | 2,27 | 40\*52'13.15 | 68\*15'15.54 |
| 22 | Turkestan | K-30-II | Inter-farm channel | lined | Mash kanal | Zhetysay | 8,1 | 1 | 1 484 | 6 | 1,2 | 1,6 | 40\*54'00.97 | 68\*17'49.40 |
| 23 | Turkestan |  K-34 | Inter-farm channel | earthy | Dostyk | Zhetysay | 18,5 | 11,9 | 10 485 | 10,6 | 4 | 1,9 | 40\*53'32.91 | 68\*14'06.10 |
| 24 | Turkestan | K-MO-1 | Inter-farm channel | earthy | Dostyk | Zhetysay | 7.20 | 1.00 | 407.00 | 5.4 | 1.2 | 1.7 | 40\*50'41.44 | 68\*16'31.02 |
| 25 | Turkestan | K-P-1 | Inter-farm channel | earthy | Dostyk | Maktaral | 0.95 | 1.00 | 531.16 | 15.00 | 3.0 | 5.0 | 40\*44'33.79 | 68\*24'37.86 |
| **Total for 2023:** |  |  | **343.95** |  | **112 422.34** |   |   |   |  |  |

**Automatic Gate and metering**

**К-21 ПК 45+00 (4 st. of gate), ПК 95+00 (3 st. Of Gate), ПК 123+29 (2 st. Of Gate), ПК 148+58 (3 st.of Gate) Total: 12 state of Gate**

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