

Section VII – Employer's Requirements

I – General Information

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1. GENERAL INFORMATION

1.1. GENERAL DESCRIPTION OF THE WORKS

Antalya Province is on the Mediterranean coast of south-west Türkiye, between the Taurus Mountains and the Mediterranean Sea. The total area of the province is 21,000 km² with a total population of 2.69 million in 2022.

The existing Hurma WWTP was constructed in 2001-2003 and it is located about 10 km south-west of Antalya. Hurma WWTP which is currently in operation, is on an area of 163,524.70 m².

Within the scope of the Contract No. ASAT/C1 Waste Sludge Incineration and Energy Recovery Facility Project (Design-Build-Operate), The Antalya Metropolitan Municipality-General Directorate of Antalya Water and Wastewater Administration (ASAT) intends to construct sludge incineration facility within the boundary of Hurma Wastewater Treatment Plant (WWTP) in Konyaaltı District- Antalya, Türkiye with a capacity of 500 tons/day (18% DS) and 25 tons/day (%90 DS) [total capacity is 525 tons/day inlet sludge] for disposal of domestic waste sludges that are being produced in central and district WWTPs. In this context, waste sludge produced in these wastewater treatment plants shall be transferred to the Hurma Waste to Energy Facility (Hurma WTE Facility) that shall be constructed.

In the current situation, all 30 nos of treatment plants are being operated by the Employer. The biological sludge produced from these WWTPs are sent to licensed sludge disposal facilities (cement factories) after dewatering. Only Hurma WWTP's sludge treatment is different than other facilities. Because there is a digestion process in Hurma WWTP, combined primary sludge and biological sludges are digested anaerobically. Currently, dewatered sludge capacity of Hurma WWTP is around 250 tons/day. On the other hand, the Lara WWTP has 150 tons/day sludge production capacity after centrifuge dewatering. The remaining 28 nos of District WWTPs produce 220 tonnes/day sludge. All dewatered sludges have average 18% dry solids content. In current situation, 120 tons/day dewatered sludge from District's WWTPs is being proceed in existing thermal sludge drying facility and obtain around 25 tons/day with %90 DS dried sludge. The dewatered sludges from Lara WWTP and other 28 facilities (150 tons/day + 100 tons/day) shall be transported to service area of Hurma WWTP. Then, total sludge amount of 500 ton/day with %18 DS dewatered and 25 tons/day with %90 DS dried sludge shall be proceeded in Hurma WTE Facility.

The scope of the work consists of

- (a) Sludge Acceptance/Storage Unit
- (b) Sludge Pre-drying Unit,
- (c) Odour Control Unit,
- (d) Fluidized Bed Incinerator (FBI) Unit with Heat Recovery System
- (e) Energy Recovery Unit with Steam Turbine
- (f) Flue Gas Emission Control Unit.
- (g) Ash Collection and Storage Unit

Hurma WTE Facility shall be designed considering the following key elements:

1. It should maximize energy recovery and electricity production. The energy loss system should be minimum and the waste heat generated in the system should be used to meet the energy needs of the system.
2. It should be integrated to the existing sludge dewatering line and to the existing sludge drying facility of Hurma WWTP as well.
3. It should include a new pre-drying unit designed to bring the 500 tons/day 18% dewatered sludge to the dryness level required for autothermicity in the FBI unit. (minimum dryness 36%)
4. It should include a FBI unit designed to process the 90% DS sludge coming from the existing sludge drying facility and the sludge with a minimum of 36% DS coming from the new pre-drying units of Hurma WTE facility.

However, in the event that the actual calorific value of the sludge during operation changing the expected value of 3,500 kcal/kg, the pre-drying unit shall be capable of being operated within a flexible dry solids range of 30% to 45% throughout the operational period, taking into account the energy efficiency of the pre-drying and incineration system as well as the plasticity zone of sludge considerations of the process.

5. It should have uninterrupted operation management, that uses the heat energy produced in the system with maximum benefit without the need for external fuel and uses the remaining heat energy in electricity production.
6. It should comply with air emission regulations of the European Union and of the Republic of Türkiye.

The duration of the Contract is 48 months (4 years) divided into 24 months (730 days) of Design-Build period and 24 months (730 days) of Operation Service Period.

The requirements for the execution and completion of the Design-Build Works, as well as the Operation Service of the Facility, are defined in the Conditions of Contract for Design, Build, and Operate (hereinafter referred to as the "FIDIC Gold Book") and in Part 3 – Conditions of Contract and Contract Forms, as well as Part 2 – Section VII: Employer's Requirements of the Bidding Documents for the Procurement of Works.

The expected operational lifespan of the incineration system is estimated to be 15 years.

1.2. PURPOSE OF THE WORKS

The main objectives of the Project are energy recovery, reduction of carbon footprint, elimination of external dependency in sludge disposal and ensuring sustainable environmental quality, as well as sludge disposal. It is aimed that the works to be built shall have optimal energy efficiency and heat balance, and it is requested to be designed and constructed in accordance with environmental and occupational health and safety standards, permits and regulations.

The Employer's expectations for the project under the Hurma WTE Facility to be constructed at the Hurma Wastewater Treatment facility are summarized below:

- 1) At least two parallel sludge collection units must be constructed to store the sludge generated from the Hurma WWTP and incoming sludge, ensuring the stable operation of the drying/incineration facility. Odor control in these units is also required.

- 2) For the drying of dewatered sludge with high water content prior to incineration, at least four (4) thermal sludge drying unit lines (process of the pre-dryer can be changed depend on the contractor's proposed method, heat recovery efficiency of pre-drier should be high) are required. The water content of the sludge shall be adjusted to be suitable for the autothermal incineration process and then directed to the sludge incineration units through an appropriate feeding system. The thermal energy for sludge drying can be obtained from the heat recovery unit of the sludge incineration unit and/or from the steam turbine. The new pre-drying unit shall be planned in such a way that the operation of the rest of the facility is not disrupted during maintenance periods.
- 3) The sludge incineration system should be selected as a Fluidized Bed Type (FBI) with at least two parallel lines. Pre-dried sludge feeding coming from new pre-drying unit shall be carried out at least from two different points into the fluidized bed. The existing dried sludge with %90 DS feeding coming from existing thermal sludge drying unit shall be carried out separate point or/points into the fluidized bed. The excess air required for the fluidized bed shall be heated and obtained from the heat recovery system after the FBI (Fluidized Bed Incinerator). Auxiliary fuel shall only be used during the start-up of the facility. No additional fuel shall be used during steady state operation. Hurma WTE Facility project shall be designed to be self-sufficient in energy. High-pressure steam shall be generated from the heat energy obtained from the incinerator, and electricity shall be produced in the steam turbine. The incineration system shall be designed to meet the capacity with %110 needs without requiring additional energy. The incineration system shall be designed to meet 10% more of the capacity requirement (capacity requirement is 500 tons/day (18% DS) and 25 tons/day (%90 DS) [total capacity is 525 tons/day inlet sludge]) without requiring additional energy.
- 4) After the heat energy obtained from the incineration of sludge meets the requirements of heat energy of the WTE plant, such as heating of the combustion air, heating of sludge, evaporation of the moisture in the sludge, heat requirement of the pre-dryers. The remaining heat energy shall be determined by the Contractor based on heat calculations and the energy production unit shall be installed for the production of electrical energy.
- 5) The flue gas generated after sludge incineration contains PM, NOx, SOx, HF, HCl, and other acidic gases, as well as toxic organic pollutants (e.g., PAHs, PCDD/Fs) and inorganic pollutants (e.g., trace elements). Emissions formed in waste gas must meet the limits given by Turkish and EU authorities. In the treatment of these pollutants, particulate matter (PM) should be removed to a certain extent, followed by the addition of chemicals (such as Ca- or Na-based compounds and activated carbon) to remove both organic and inorganic gaseous pollutants. Dry type gas treatment systems shall be selected for flue gas treatment as a priority and necessary measures shall be taken for emission control. However, wet type flue gas treatment systems can also be added to make emission values compliant with the legislation. In case of addition of wet type flue gas treatment systems, considering the visual integration to the environment of outlet flue gas. A stack shall be established depending on the emission calculations required for the discharge of treated flue gas from the stack. The stack should be constructed with a minimum height of 40 meters and the temperature of the flue gas should be at least 140°C for visual purposes. A suitable process shall be added for the condensation of treated flue gas under normal operating conditions. In addition, the heat of the flue gas shall be recovered to the WTE Facility by establishing

energy recycling. The Contractor shall submit detailed process calculations and draft designs regarding flue gas treatment in the WTE Facility in their technical bid.

- 6)** The fly ash produced at the facility shall be cooled and processed into bags, while bottom ash shall be treated in a way that allows transportation by trucks. All waste generated after incineration shall be designed to be directly collected from the site where it is produced.

The schematic diagram of the units that summarised the above objectives of the project is given below in **Figure 1**. Heat, sludge, air, flue gas lines and layout of the units are prepared for only demonstration. Process diagram shall be arranged and/or developed according to the Contractor's proposed systems.

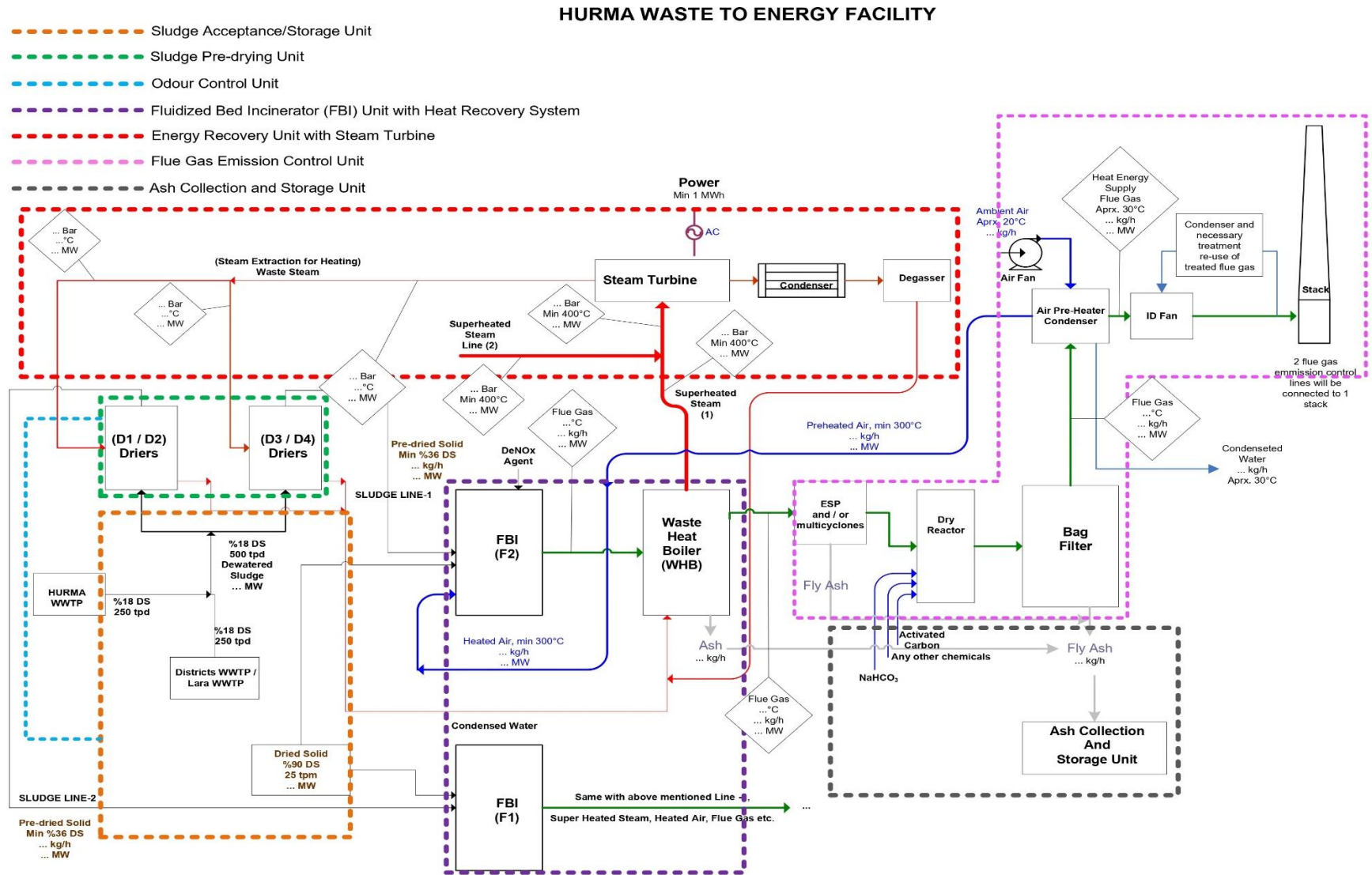


Figure 1: Process Schematic Diagram

1.3. SITE STATUS AND CONDITIONS

1.3.1. Permissions for Construction and Operation Stages

Hurma Wastewater Treatment Plant is located in the Hurma neighbourhood of Konyaaltı district of Antalya Province, and the area allocated to the General Directorate of ASAT General is approximately 76,000 m². The site is owned by the Employer, and all construction and operation activities within the scope of the Contract shall be carried out within this area.

Environmental Impact Assessment Procedures have been completed according to the Environmental Impact Assessment Regulation published in the Official Gazette dated July 29, 2022 and numbered 31907, related permission for the construction phase also has been taken from the Ministry of Environmental, Urbanization and Climate Change.

According to Environmental Impact Assessment Permission from the Ministry of Environment, Urbanization and Climate Change related to contraction works, the Contractor shall execute the works of the Design-Build with due expedition and without delay on commencement date according to GCC 9.1.

At the end of the Design-Build period, the Contractor shall complete the whole of the Design-Build of works and shall carry out the tests on completion of Design-Build in accordance with GCC 11.1 and shall prepare and be approved the As-built Documents and Operation and Maintenance Manuals according to GCC 5.5 and 5.6.

The Employer shall apply for an operating permit by submitting the as-built documents and operation-maintenance manuals prepared by the Contractor, in accordance with the provisions of the "Regulation on the Incineration of Waste" published in the Official Gazette dated 06.10.2010 and numbered 27721, and the provisions of the "Environmental Permit and License Regulation" published in the Official Gazette dated 10/9/2014 and numbered 29115. During this operating application phase, the Contractor is responsible for preparing all necessary documents and as-built documents in the format requested by the Ministry of Environment, Urbanization and Climate Change and submitting them to the Employer.

A trial incineration must be carried out within the period of the temporary activity certificate issued in accordance with the provisions of the Environmental Permit and License Regulation. During the receiving of the operation license by the Employer, the Contractor is responsible for analyzing the waste to be incinerated in the Hurma WTE Facility, proving the standards regarding the emissions and wastewater to be generated depending on the inlet sludge rate, and determining the relevant measurements are performed regularly or recorded.

During trial operation, when the Works are operating under stable conditions, the Contractor shall give Notice to the Employer's Representative that the Works are ready for any other Tests on Completion of Design-Build, including performance tests to demonstrate whether the Works conform with criteria specified in the Employer's Requirements and with the Schedule of Guarantees. Trial operation shall not constitute a commencement of the Operation Service under Sub-Clause 10.2 of GCC.

The Employer Representative shall issue the Commissioning Certificate stating the date upon which the Design-Built has been completed and operation service shall commence if the procedures to be carried above mentioned obligations and obtaining the temporary activity license for operation within the scope of the "Environmental Permit and License Regulation"

The temporary operating license shall be obtained in the name of General Directorate of ASAT and the Contractor's name shall be specified as the operator in the operating license and the Contractor shall be responsible for the operation for 2 years (730 days). In this content, the payment of all kinds of fees and expenses related to the permit and license procedures shall be the responsibility of the Employer. However, the obligations specified in the "Environmental Permit and License Regulation" and "Waste Incineration Regulation" shall be under the responsibility of the Contractor during the operation period with 2 years (730 days). During the commissioning period of the facility, the required permit and licence applications to be made according to the Ministry of Environment, Urbanisation and Climate Change Regulation on Waste Incineration, trial incineration for 3 months and tests shall be completed. During this period, the tests and inspections specified in the document and required by the regulation must be carried out simultaneously by the Contractor and their costs must be covered. No additional payment shall be made by the Employer for this.

1.3.2. Construction Site

The Works shall be carried out in the blue hatched area in **Figure 2**Figure 2.

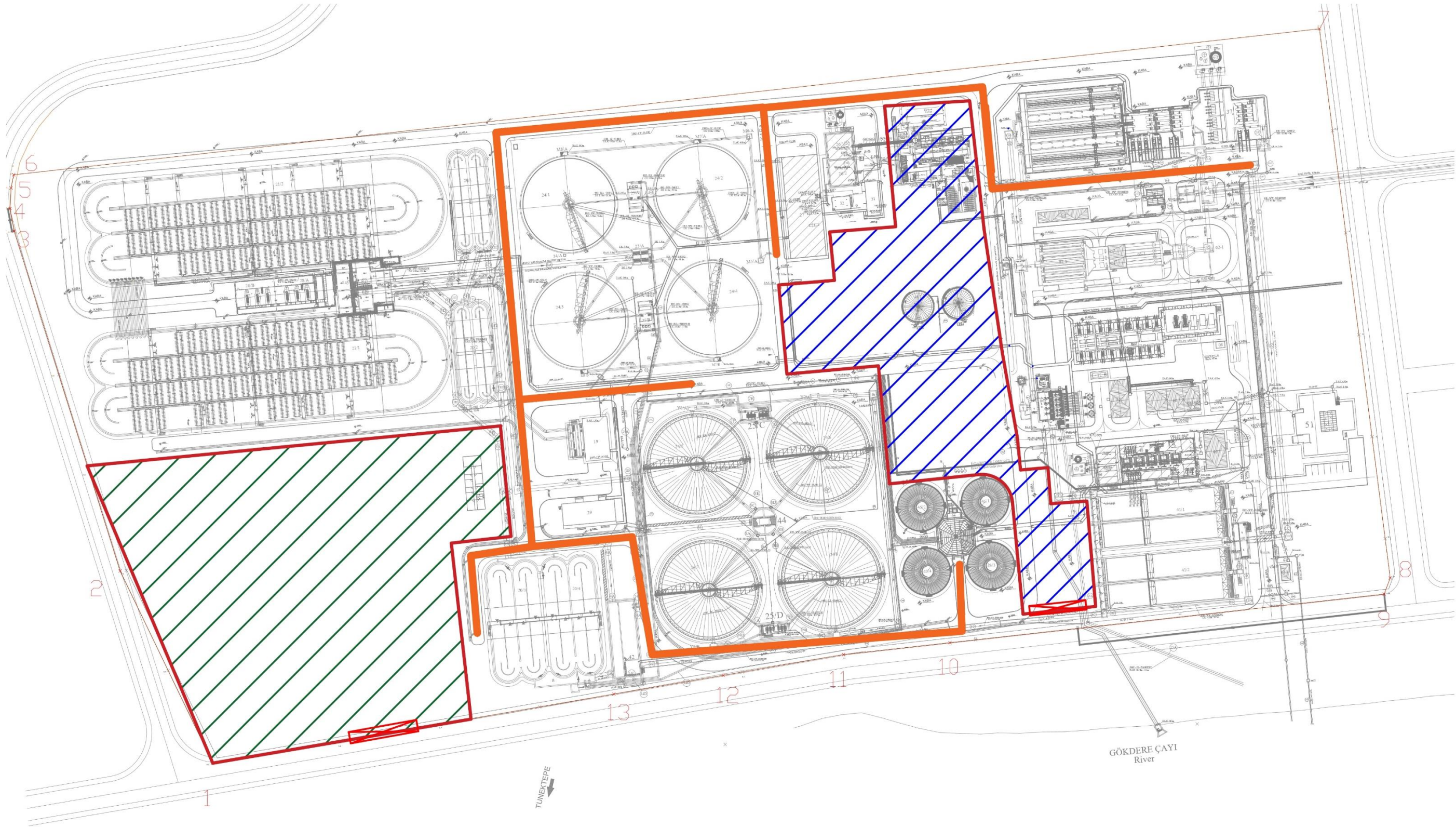


Figure 2: Construction Site (hatched blue area) and area available for temporary occupation during the construction period for warehouse, office, etc. (green hatched area)

Any active construction works are not been executed by the other parties in the construction site. Existing infrastructure shall be protected by the Contractor, except for those that need to be replacement. Replacement of infrastructure and/or super structure works shall be carried out in accordance with the instructions of the Employer's Representative.

Any other Contractor shall not be required to work on Construction Site during the Design-Build period.

In Hurma Wastewater Treatment Plant, biological sludge and primary sludge are mixed and subjected to a thickening process and then transferred to digesters by The Employer. The Employer shall be responsible for the operation of digestion, obtaining biogas, transferring the digested sludge to the existing dewatering unit and dewatering the sludge during the Design-Build and Operation Service periods.

The Contractor's liability for the sludge process of the Hurma Wastewater Treatment Plant shall start downstream the sludge dewatering unit. During the Design-Build Period, the Contractor shall be responsible for construction of connection lines between the existing dewatering structure and the new Hurma WTE Facility sludge acceptance/storage structure and operating this connection line during the Operation Service Period.

In addition, the Employer shall be responsible for transportation of the sludge from the treatment plants in the districts to the Hurma WTE Facility sludge acceptance/storage structure. The Contractor shall be responsible for ensuring the stable operation of the new Hurma WTE Facility.

In **Figure 2**, the blue shaded area indicates the area to be used for construction work, the green shaded area indicates the area to be used as the construction site offices and Contractor's goods warehouse. The orange line indicates the path that the Employer's personnel shall use to reach the existing facility, especially the sludge drying and dewatering unit, at the Hurma WWTP. Mentioned orange road shall be constructed by the Contractor temporarily and shall used temporarily by the Employer's personnel so that the construction work and the ongoing operation works of existing wastewater treatment plant do not interfere with each other within the construction site.

Wastewater treatment service is executed during 24 hours a day, 7 days a week at Hurma WWTP. The Employer shall only be responsible for the security of the main gate of the existing WWTP and the security recording system in the sections where no construction is carried out.

During the Design-Build period, the security of the green and blue shaded areas shown in **Figure 2** and maintaining the safe entry and exit to these areas shall be under the responsibility of the Contractor. For this reason, The Contractor shall charge the security personnel to be present 24/7 at the entrance gates for these areas in **Figure 2**. Temporary protection walls and/or barriers shall be constructed by the Contractor to separate the green and blue shaded areas from the existing WWTP. The Contractor shall take all precautions to prevent damage to other parts of the WWTP due to security weaknesses originating from these areas under the responsibility of the Contractor. The storage of the goods that shall be supplied and security of the construction vehicles during the Design-Build Period shall be under the responsibility of the Contractor as well.

The Contractor shall work in accordance with the Employer's safety directive as described below.

Employer's Safety Directive

General Directorate of ASAT (Employer) is subject to Law No. 5188 to provide complementary private security services to public security and has a Protection and Security Branch Directorate. Security personnel working conditions within the Employer are subject to the procedures written in Security instructions of Employer. There is a private security personnel at Hurma WWTP 24/7, and visitors and vehicles are welcomed and registered by security personnel.

At the same time, ASAT Personnel are on duty 24/7 in the field and operational activities of the WWTP is being executed without interruption.

General Directorate of ASAT has a private security service to ensure the security of the entire WWTP site. Necessary instructions have been prepared to protect the WWTP and ensure the safety of property and life of employees. List of Legislation for Employer Security Procedures:

- Private Security Services Law No. 5188
- Firearms and Knives Law No. 6136
- Turkish Penal Code No. 5237
- Criminal Procedure Law No. 5271
- Regulation on Judicial and Preventive Searches
- Regulation on Arrest, Detention and Taking Statements
- Regulation on the Implementation of Law No. 5188

1.3.3. Access Route

Access to the site shall be via the secondary public road in the western direction where the entrance gate of the Hurma WWTP is located. The Contractor shall comply with all rules and regulations regarding the use of public roads.

The Contractor's personnel and construction vehicles shall access the WWTP from the construction site entrance gate specified in **Figure 2**. The Employer's personnel shall access the Hurma WWTP from the main entrance gate.

The temporary closure of the construction site specified in section 1.c.2 and the construction of temporary access roads both within the construction site and in the sections to be used by the Employer and Employer Representative are under the responsibility of the Contractor.

Any payment shall not be applied to the Contractor for constructing temporary roads or for improving, repairing or maintaining an existing road or structure that may be used by the Contractor during the execution of design-built works. The cost of all temporary roads within the boundaries of the areas where the construction and construction site offices are located shall be included in the agreed contract price.

1.3.4. Contractors in the Construction Site

Hurma WWTP is being operated by the personnel of General Directorate of ASAT. The Hurma WWTP has being operated 24 hours a day, 7 days a week and the operation is managed with a shift working system to execute the operation activities.

In order to execute the operational activities of the Hurma WWTP, chemical supply, transferring of solid waste, transferring of dewatering sludge and wastewater acceptance via septic tanks are carried out through the private and/or authorized companies and municipality

The services of the above mentioned private/authorized companies and municipality shall be executed on the temporary access roads that shall be constructed for design-build period. Other Contractors/or supplier/or municipality services shall not constitute an impediment on Contractor's design-build works. During the operation period, the temporary roads and closures and temporary barriers constructed by the Contractor for the blue and green shaded sections in **Figure 2** shall be removed. During the operation period, the Contractor shall be able to use the administrative building of the newly established Hurma WTE facility and the offices that shall be established in the green section for design-build works. The places where the Contractor is responsible for the operation:

- Operation of the transferring line from the existing dewatering building
- Operation of at least two parallel sludge acceptance storage sections
- Operation of Sludge Drying section of New Hurma WTE Facility with all components (energy supply, energy recovery, inlet and outlet of sludge, odour control unit, etc.)
- Operation of Sludge incineration section
- Operation of Dry-typed flue gas treatment section/flue gas emission control system
- Operation services related to fly ash.
- Operation of Energy recovery section

1.3.5. Existing Services

After the Employer's Representative notify the Commencement Date, the Contractor shall submit the detailed work program including the anticipated timing of each stage of design, Contractor's Documents, procurement, manufacture, inspection, delivery to Site, construction, erection, testing, commissioning and trial operation and the period of Operation Services.

The Contractor shall start immediately works within the scope of design-build period.

The Contractor shall perform initial site inspections and prepare a plan for both the temporary site offices and construction area, as well as the existing infrastructure and existing WWTP at the construction site and submit it to the Employer's Representative for approval. The Contractor shall prepare the infrastructure plans and related work principles for the area where the construction work shall be carried out and submit them to the Employer's Representative. If the Contractor determined that any infrastructure and/or existing building and/or services is not as specified in the Employer's Requirement Part, the Contractor shall immediately notify the Employer's Representative in writing. The Contractor shall record the location of all existing services/infrastructures and existing facility structures on the site plan, and a copy shall be forwarded to the Employer's Representative by the Contractor. Existing General Layout and Pipe Line of the Hurma WWTP has been attached to bidding documents.

The Contractor shall carry out the work in a manner that shall not damage or interfere with the existing services at the site during the work. If any such damage occurs, the Contractor shall make the necessary remediation and maintenance works under the agreed contract price, subject to the approval of the Employer's Representative.

The Contractor shall protect all existing pipes, cables, structures and existing treatment plants by temporary or permanent methods in all works to be carried out during the design-build period.

During the Operation Service Period, while operating the new Hurma WTE Facility, the Contractor shall not create any obstacle to the operation of other existing units related to sludge removal and other relevant units connected to new facility.

The Contractor can use the existing water network, stormwater, wastewater, electricity, natural and biogas on the site during the design-build and operation periods.

For the electricity to be used by the Contractor in all kinds of works in the construction site, a line shall be drawn from the existing electricity network and a meter shall be placed on the drawn line to monitor internal consumption. The electricity bill shall be collected according to the Contractor's consumption read from this meter and the unit electricity price of that month.

The Contractor is responsible for the fuel expenses of the generator that may be procured in order to prevent negativities such as the cessation of work within the construction site, the inability of workers to continue their daily lives, etc. as a result of the construction site being left without electricity.

For the water to be used by the Contractor in the construction site, a water line shall be drawn from the existing water meter in the facility to the construction site and a water meter shall be placed on this line. The amount calculated from the water consumption read from this meter and the water consumption fee of that month shall be collected from the Contractor. The water line to be taken from the existing water line in the facility shall be constructed by the Contractor.

Connections between existing pipework and new pipework shall not be made until the necessary inspection and tests have been completed and the Employer's Representative has approved the new pipework.

Communication needs in the construction site shall be determined by the Contractor, and if necessary, expenses such as telephone line, internet line, radio need, etc. shall be covered by the Contractor.

Above mentioned infrastructure networks shall be supplied during the construction and operation phases for construction works and accommodation requirements. Connection points are shown in **Figure 3**.

Network Services Values

Biogas

Flow Rate : 417 Nm³/hour (10.000 m³/day)

Upper Calorific Value : 5.740 kcal/Nm³

Lower Calorific Value : 5.160 kcal/Nm³

Biogas supply system and piping shall be built in the facility. The Contractor shall design and construct the facility by foreseeing this situation.

Natural Gas

Flow Rate : 1,050 m³/hour

Supply Pressure : 4 bars

Upper Calorific Value : 9.100 kcal/Nm³

Lower Calorific Value : 8.250 kcal/Nm³

The natural gas and biogas supply system and piping in the facility shall be made according to the above value. It is foreseen that this natural gas shall be used only for the start-up period. The fluidized bed incineration furnace shall be fed at the auto thermal point. The Contractor may use natural gas only to ensure the temperature balance inside the furnace during the operation period.

However, biogas shall not be used during operational services by the Contractor. In this respect, any guaranteed consumption value is not expected from the Contractor within the scope of the Contract.

Furthermore, in order to observe operational conditions in integration with biogas, the Contractor shall execute the trial operation by using biogas (if required mixed natural gas and biogas) during one month of the trial operation period.

Electricity Power

34500 V / 3 phase / 50 Hz– Transformer apparent power 3 KVA / Transformer output voltage 400 volts

Flow and Characterization of Treated Wastewater

Flow Rate: 200,000 m³/day

Parameter	Result of Test	Measurement Deviations
Electrical Conductivity (μS/cm)	998,00	±16,37
pH	7,01	±0,04
Biochemical Oxygen Demand (BOD) (mg/L)	18,00	±3,17
Chemical Oxygen Demand (COD – Closed Reflux) (mg/L)	112,00	±6,23
Total Suspended Solids (mg/L)	10,00	±0,95
Chromium (+6) (mg/L)	<0,1	-
Color (CU)	72,32	±1,74
Aluminum (μg/L)	<10	-
Ammonium (mg/L)	0,31	±0,09
Copper (μg/L)	<10	-
Barium (μg/L)	<10	-
Boron (μg/L)	<10	-
Zinc (μg/L)	<10	-

Iron (µg/L)	<10	-
Phosphate (mg/L)	1,63	±0,11
Cadmium (µg/L)	<10	-
Calcium (mg/L)	101,13	±3,82
Chloride (mg/L)	299,67	±14,20
Cobalt (µg/L)	<10	-
Lead (µg/L)	<10	-
Lithium (mg/L)	<0,05	-
Magnesium (mg/L)	27,59	±4,66
Manganese (µg/L)	<10	-
Nickel (µg/L)	<10	-
Nitrate (mg/L)	3,64	±0,38
Nitrite (mg/L)	<0,5	-
Potassium (mg/L)	32,31	±2,52
Sodium (mg/L)	215,44	±5,69
Sulfate (mg/L)	62,84	±2,98
Total Nitrogen (mg/L)	5,52	±0,93
Total Phosphorus (mg/L)	0,75	±0,05
Total Chromium (µg/L)	<10	-
Total Organic Carbon (mg/L)	7,65	±0,34
Orthophosphate (mg/L)	1,63	±0,11
Orthophosphate Phosphorus (mg/L)	0,53	-
Ammonium Nitrogen (mg/L)	0,24	±0,07
Nitrate Nitrogen (mg/L)	0,83	±0,08
Nitrite Nitrogen (mg/L)	<0,15	-

Bromide (µg/L)	<500	-
Fluoride (µg/L)	300,00	-

Flow and Characterization of Potable (Municipal) Water Network:

Flow Rate: 25 m³/day

Parameter	Result of Test	Measurement Deviations
Odor and Taste	Normal	-
Electrical Conductivity (µS/cm)	567,00	±35
Turbidity (NTU)	1,07	±0,05
Fluoride (mg/L)	0,06	±0,00
Chloride (mg/L)	15,80	±0,91
Nitrite (mg/L)	<0,2	0,00
Nitrate (mg/L)	7,99	±0,45
Sulfate (mg/L)	30,00	±1,5
Phosphate (mg/L)	<0,4	0,00
Bromate (µg/L)	<3	0,00
Lithium (mg/L)	<0,1	0,00
Sodium (mg/L)	14,40	±0,69
Ammonium (mg/L)	<0,1	0,00
Potassium (mg/L)	<1	0,00
Magnesium (mg/L)	28,43	±1,21
Calcium (mg/L)	66,17	±3,71
Total Hardness (°fH)	28,39	±1,55
Total Organic Carbon (mg/L)	0,49	±0,07
Mercury (µg/L)	<0,5	±0,00
Lead (µg/L)	<1	±0,00

Chromium (µg/L)	4,49	±0,35
Manganese (µg/L)	<2	±0,02
Boron (µg/L)	56,82	±4,00
Aluminum (µg/L)	<4	±0,25
Nickel (µg/L)	1,33	±0,11
Arsenic (µg/L)	<2	±0,03
Iron (µg/L)	19,24	±1,00
Selenium (µg/L)	<4	±0,08
Copper (µg/L)	<5	±0,17
Cadmium (µg/L)	<1	±0,00
Antimony (µg/L)	<3	±0,00
Total Coliform (cfu/100 mL)	0,00	-
Color and Appearance	Normal	-
Temperature (°C)	21,00	-
pH	7,60	±0,11
E. coli (cfu/100 mL)	0,00	-
Enterococcus (cfu/100 mL)	0,00	-

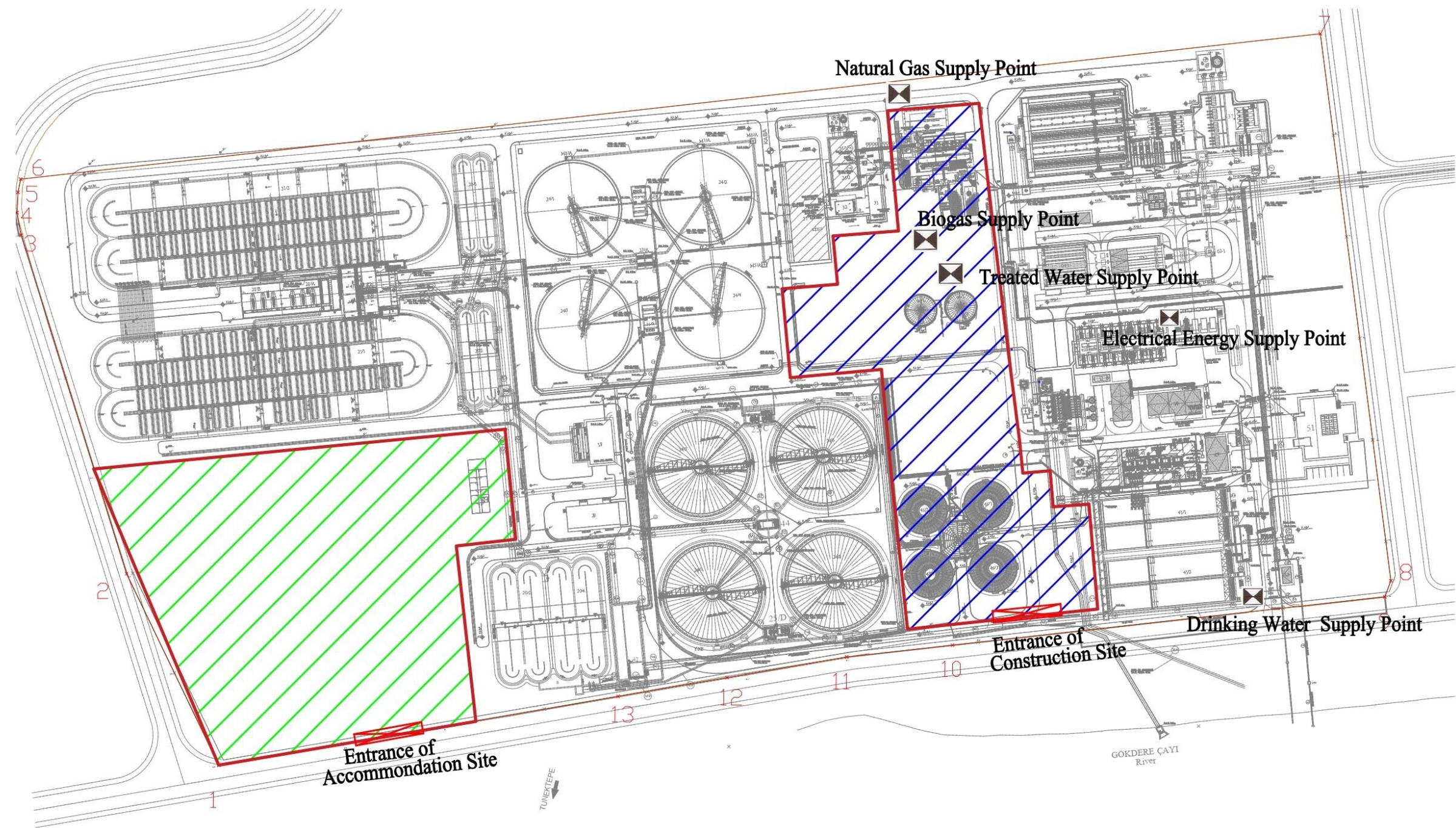


Figure 3: Infrastructure Points

1.3.5.1. Existing Situation of the Digesters and Biogas Tanks

Within the scope of the project, existing biogas storage tanks and their related pipelines and electromechanical equipment and units will be replaced to north side of digesters where is shown in figure 4 as green. All replacement investment is included in project budget. This activity will be in the scope of the Contractor and will be carried out under the project.

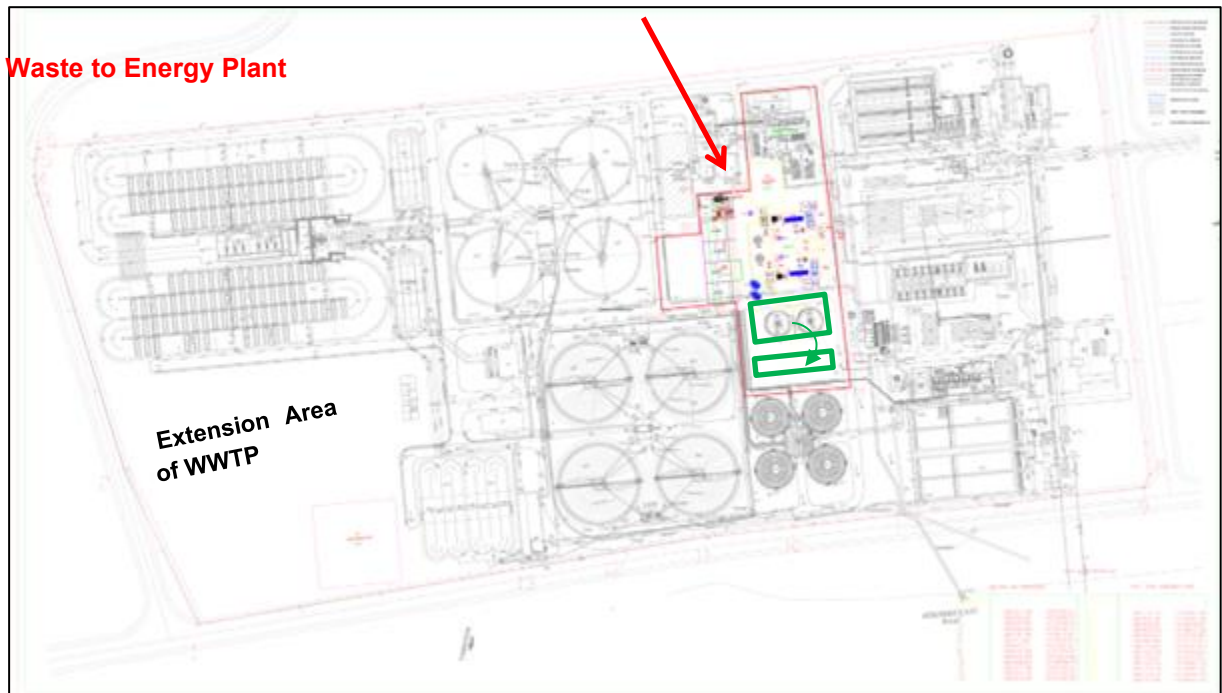


Figure 4: Replacement of Biogas Tanks Areas

The structures numbered 45/1 – 45/2 – 45/3 – 45/4 are the existing Digester units of the Hurma Wastewater Treatment Plant. Each digester has a volume of 9,000 m³.

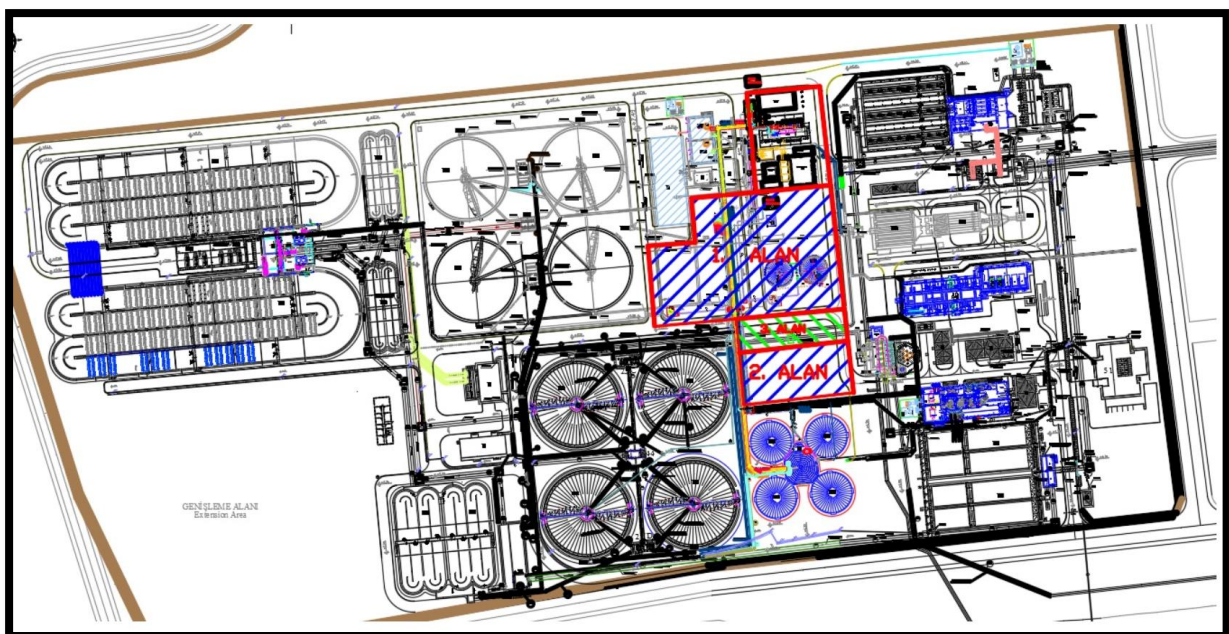


Figure 5: Hurma WWTP

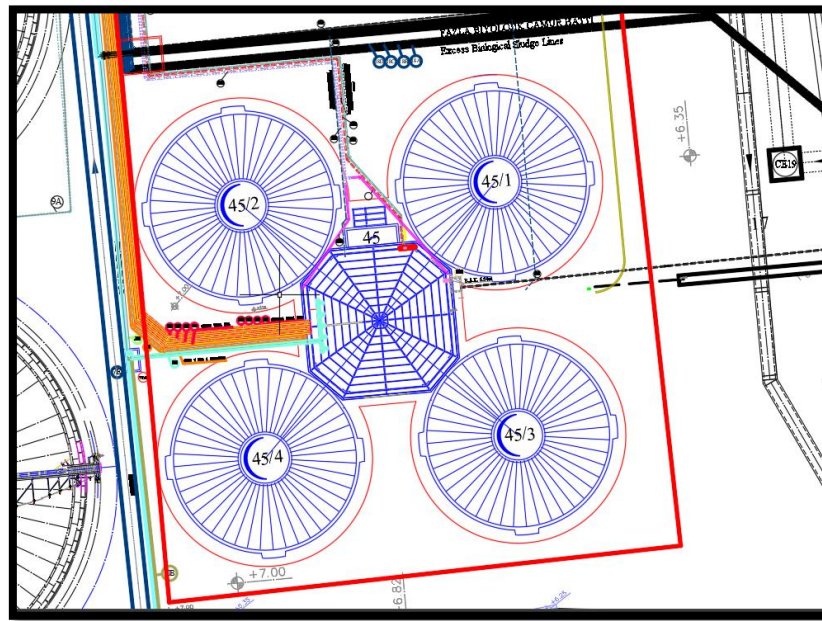


Figure 6: Placement of Digesters

Sludge digesters are used for the stabilization of biological sludge. The digestion process is carried out under anaerobic conditions and mesophilic conditions. As a result of the activities of two types of mesophilic bacterial groups (acid bacteria and methane bacteria) inside the digester, the sludge is digested, and the breakdown of organic matter in an environment without molecular oxygen at 35°C is achieved, producing biogas.

The sludge digesters are made of reinforced concrete, and their outer surfaces are insulated with polystyrene and aluminium sheets. The digester is fed with both concentrated pre-settled sludge and concentrated activated sludge.

To maintain the temperature inside the digester tank, pipe-type heat exchangers (one for each digester, a total of 4 units) and sludge circulation pumps with a capacity of 161 m³/h (5 units (4+1)) are used. The hot water supply to the heat exchangers is provided by heating in the steam boilers and is circulated using 54 m³/h capacity hot water circulation pumps (5 units (4+1)).

For homogeneous distribution of the sludge inside the digester tank, mixing is done with a shaft mixer (one for each digester, a total of 4 units), and turbulence is increased by impact plates located on the inner surface of the tank.

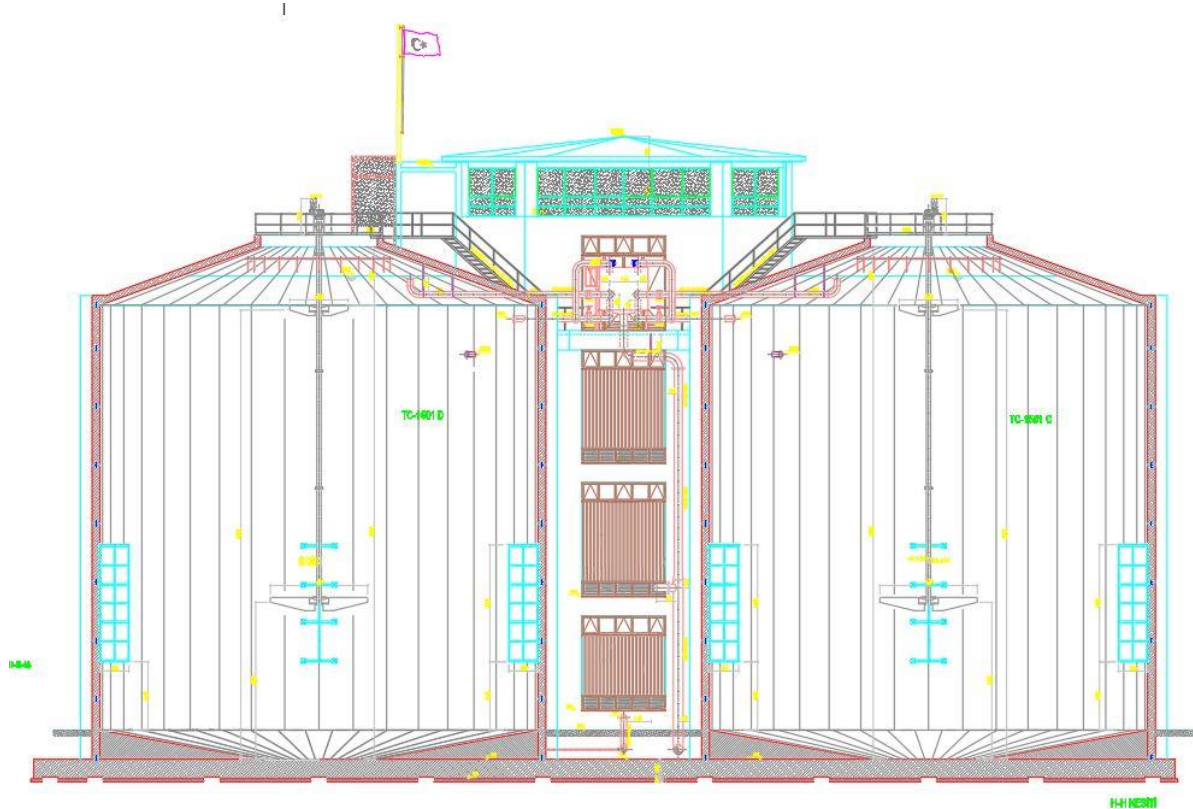


Figure 7: Digester Unit

Concentrated pre-settled sludge and concentrated excess activated sludge come from the same lines to the sludge digester tank inlet. In the event that the pH value of the sludge in the tank decreases, the pH is raised by dosing lime prepared in a lime preparation unit with a capacity of 1 m³ and lime pumps (2 units) with a capacity of 15-20 m³/h.

The digested sludge is sent to bio-P pools or the sludge storage tank via a branch taken from the circulation pump suction line.

The biogas obtained from the sludge digestion unit passes through the following safety equipment in sequence: foam trap (275 m³/h), droplet trap (275 m³/h), accumulator (particulate filter – 275 m³/h), and flame trap (275 m³/h).

The biogas produced from the digesters (the total amount of biogas produced from the sludge digesters is 1600 m³/h) is passed through the desulfurization unit. In the desulfurization unit, the H₂S gas content in the biogas is removed by a chemical washing method. The H₂S removal efficiency is determined by H₂S analysers located at the inlet and outlet lines of the desulfurization unit. The biogas, cleaned of hydrogen sulfide gas through chemical washing, is sent to the boilers with 230 m³/h capacity gas blowers. Before entering the biogas blowers, the biogas is passed through droplet traps again.

The biogas stored in the gas storage tank is used as fuel in hot water boilers (each hot water boiler has a heat capacity of 1480 kWh) for heating the sludge in the digester. The amount of produced gas is monitored by a level meter on the storage tank.

While the construction of the Hurma WTE Facility continues, the operation, maintenance, cleaning, and troubleshooting of the existing digesters will continue to be carried out by the ASAT General

Directorate's own operation team. The mentioned digesters and associated units operate continuously on a 7/24 basis. Therefore, the ASAT General Directorate's Operation Team works in 24-hour shifts.

As shown in the figures below, the Digester Building has two entrance doors. During the construction of the Hurma WTE Facility, the Contractor's personnel are prohibited from entering the Digester Building without the permission and knowledge of the ASAT General Directorate.



Figure 8: North Entrance



Figure 9: South Entrance

Digester sludge feeding building is building number 48. The general layout plan is given below.



- DN150 – HDPE100 Excess Sludge Line (Feeding)
- DN200 – HDPE100 Excess Sludge Line (Return)
- DN150 – HDPE100 Biogas Pipe
- DN300 – HDPE100 Biogas Pipe
- DN150 – HDPE100 Natural Gas Pipe
- 2000 mm SE Treated Clean Water Discharge Line
- 1500 mm SE Old Biological Treatment Intermediate Pumping Inlet Line
- DN500 – HDPE100 Digester Overflow Line
- DN300 – HDPE Pipe
- Overflow Bypass Line

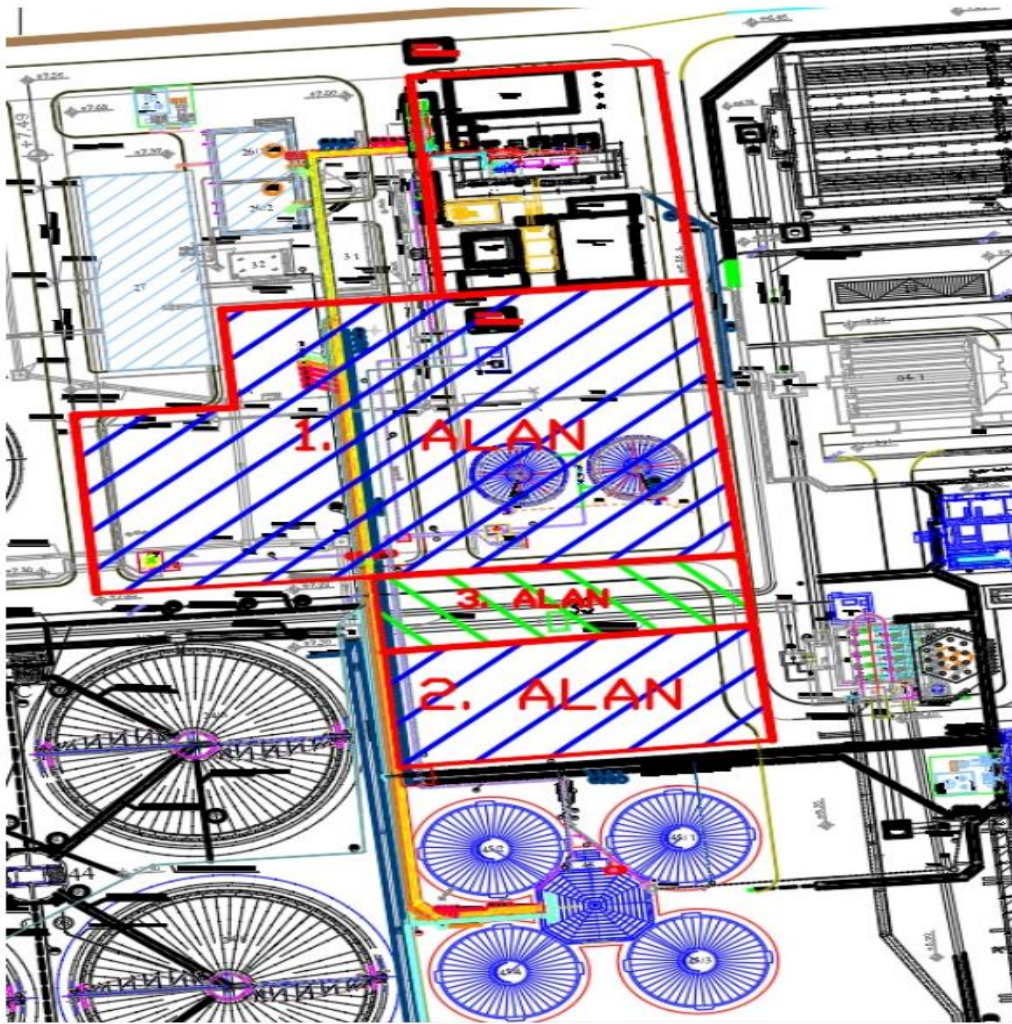
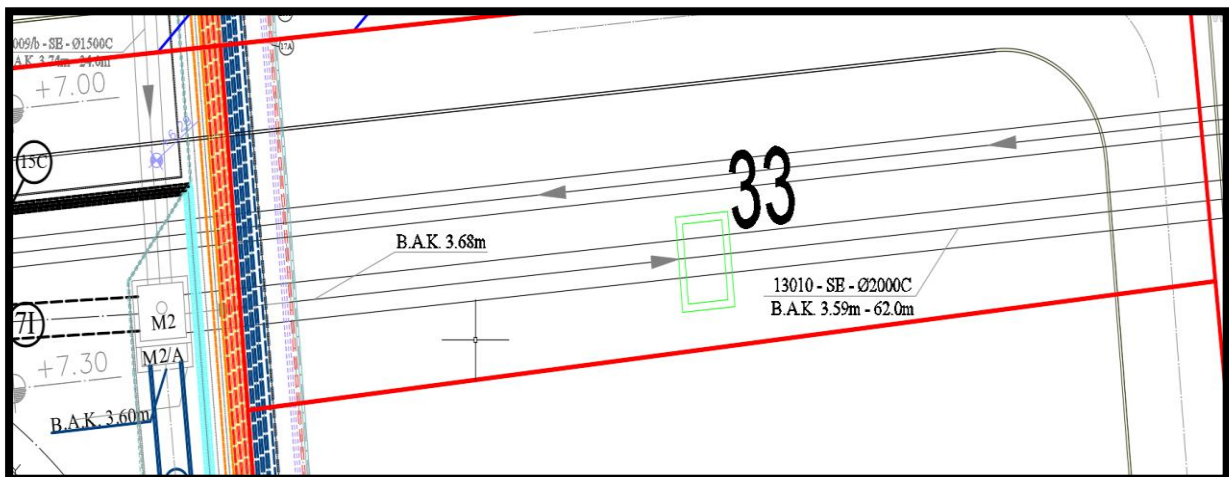


Figure 11: Construction Site Sections



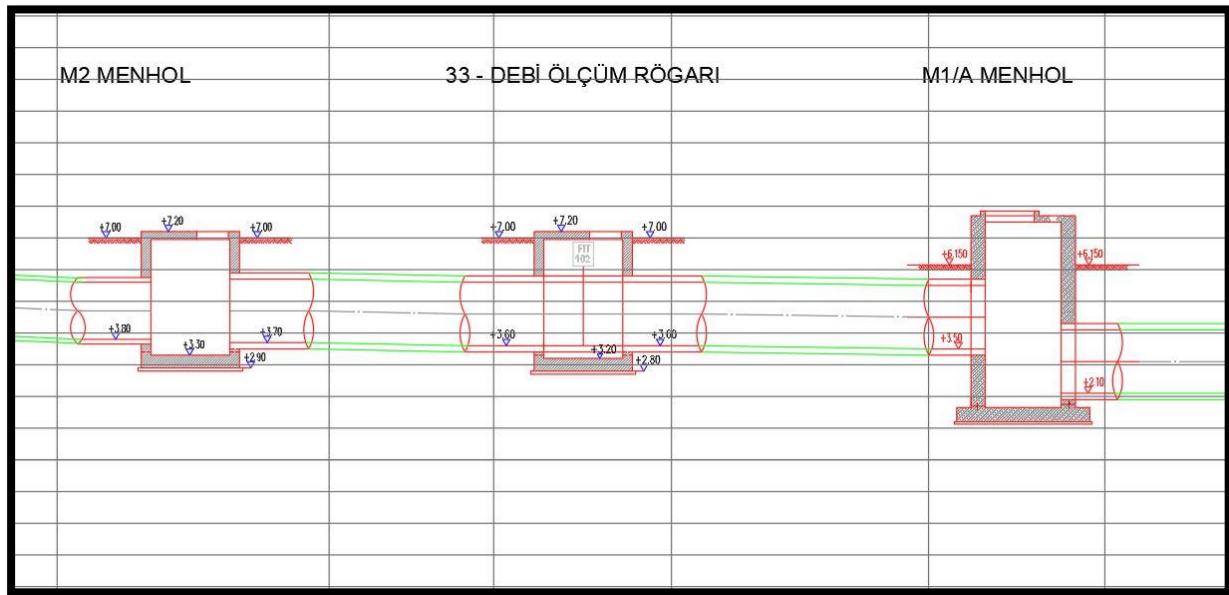


Figure 12: Flow Measurement Manhole (33) and Connected Manholes (M2-M1/A)

The area marked as number 1 in the drawing above is the main layout area for the Hurma WTE Facility. This specification follows the Design + Build + Operation model, and the detailed design of the Hurma WTE Facility, including the General Layout Plan, Units of the WTE Facility (Sludge Acceptance/Storage Unit, Sludge Pre-Drying Unit, Odour Control Unit, Fluidized Bed Incinerator (FBI) Unit with Heat Recovery System, Energy Recovery Unit with Steam Turbine, Flue gas Emission control Unit, Ash Collection and Storage Unit, Administrative Building/Unit, Laboratory Building/Unit) will be designed by the contractor.

Building No. 27 is the Mechanical Sludge Dewatering Building of the Hurma Wastewater Treatment Plant.

Mechanical Sludge Dewatering Building contains 4 GEA brand and 1 Polat brand decanters, each with a capacity of 50 m³/h. Photographs of the mono-pump and conveyor system that transfers the sludge cake with a solids content of 18–20% from the decanter outlet to the existing Belt-Type Thermal Drying Plant are provided below. Additionally, figures of the area where the sludge cake formed in the decanter is loaded onto transport trucks for disposal at another treatment facility outside the existing Belt-Type Thermal Drying Plant are also provided below.



Figure 13: Dewatered Line between Sludge Dewatering Unit and Existing Thermal Sludge Drying Unit



Figure 14: Outlet of the Dewatered Sludge for Loading of Trucks

During the construction of the Hurma WTE Facility, the ASAT General Directorate will continue to operate the decanters in Building No. 27 and will continue to dewater the sludge in the Belt-Type Thermal Drying Plant and send it to another disposal company.

As part of the Hurma WTE Facility construction, the Contractor will design and submit for approval the most efficient transmission line between the existing Sludge Dewatering Building of the Hurma

Wastewater Treatment Plant and the Sludge Acceptance/Storage Unit of the Hurma WTE Facility and between existing Thermal Sludge Drying Plant and FBI furnaces of the Fluidized Bed Incinerator (FBI) Unit. Contractor is responsible for construction of transmission systems and necessary amount and quantity of intermediate and/or final feeding silos or bunkers for mentioned both transmission line.

Access to the following areas is prohibited for the contractor's personnel without the permission and knowledge of the ASAT General Directorate: Mechanical Sludge Dewatering Building No. 48, Belt-Type Thermal Drying Plant, Biogas Incineration Unit No. 47, and the Sludge Incineration Plant construction site.

The RMS-C station for the natural gas supply to the Belt-Type Thermal Drying Plant is available. The capacity of this station is approximately 985 m³/h, and it reduces the inlet pressure from 4 bar to 1 bar.



Figure 15: RMS-C Station

Before the RMS-C station (which is also within the boundaries of the Hurma AAT), there is the RMS-B station. The RMS-B station reduces the natural gas coming from the main distribution network from 21 bar to 4 bar. The capacity of the RMS-B station is 1,050 m³/hour.



Figure 16: RMS-B Station

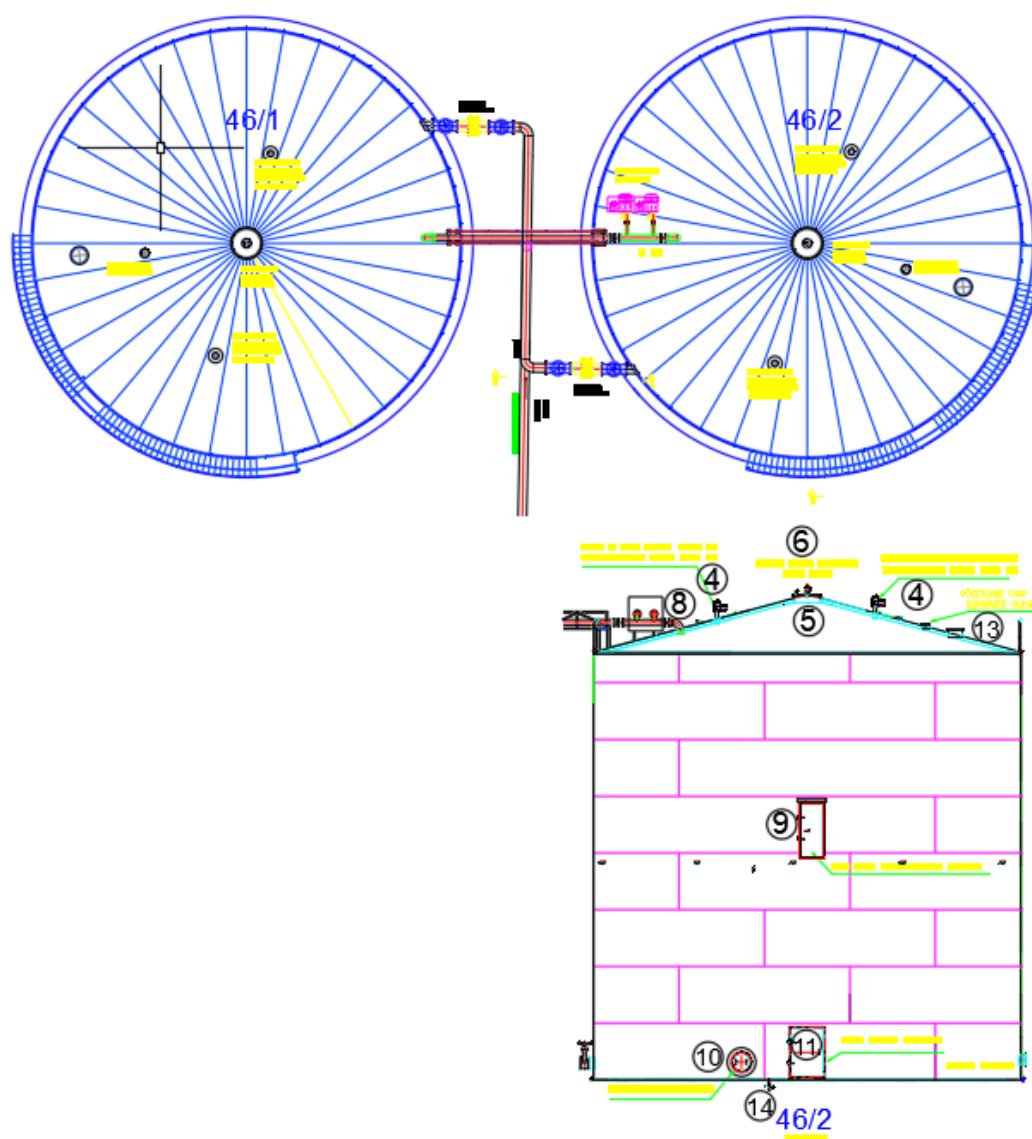


Figure 17: Gas Storage Tanks No. 46/1 and 2

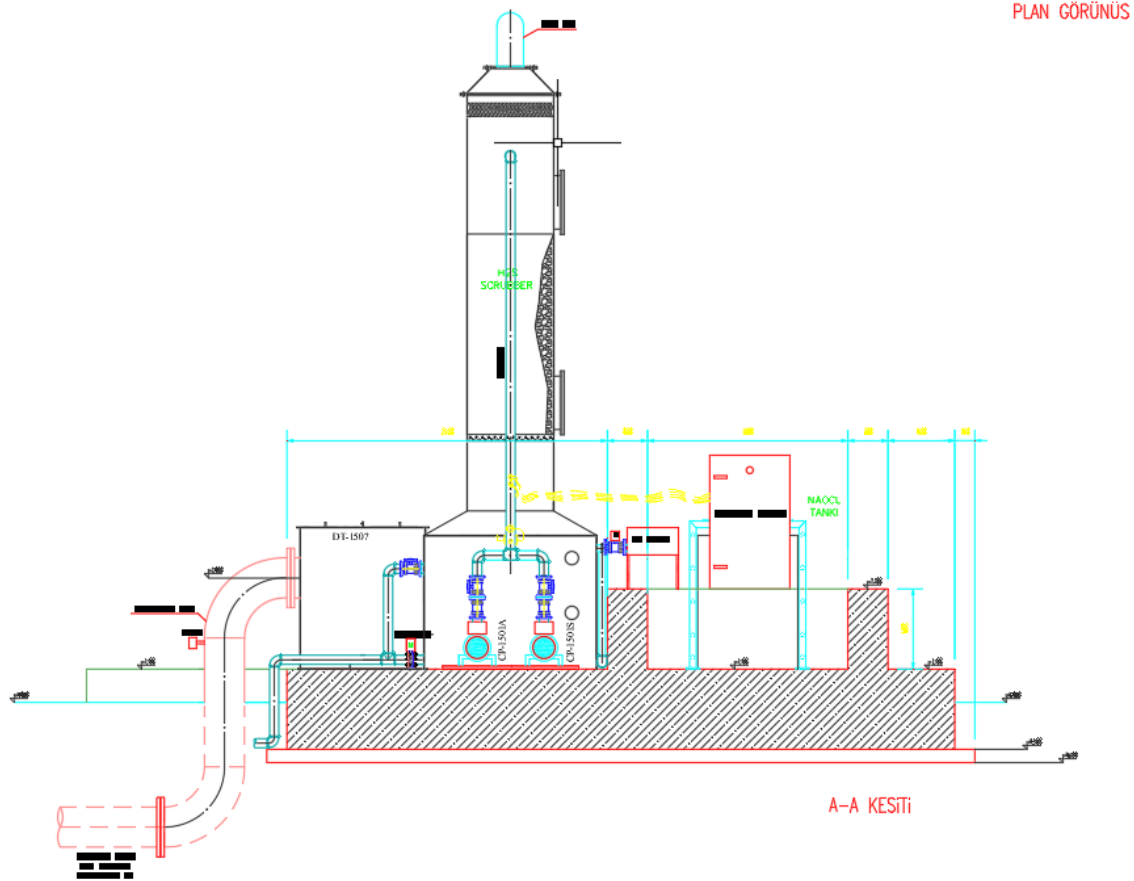


Figure 18: Desulphurization Unit



Figure 19: Gas Storage Tanks



Figure 20: Existing Flare for Digesters



Figure 21: Existing Blowers for Flare

1.3.6. Safety Measures to be Taken at the Construction Site

Two main entrances shall be established for the construction site by the Contractor to access the construction site. The Contractor shall provide, erect and maintain suitable barriers and fences to protect the work, the construction camp, accommodation site, storage site, existing facilities and construction and machinery assembly operations and shall remove them when no longer required by the Employer or when the work is completed. The constitution of related entrances and fences of construction site and accommodation site as shown in **Figure 2** shall be covered under the Contractor responsibility. Barriers shall be in good condition and in full compliance with local laws and regulations.

The Contractor shall provide security guard during and after normal working hours to protect the facilities, equipment, materials, construction machinery, etc. provided on site and to check the location and function of all signs, boardings, lights and fences. Duties of security guard shall continue until the Works have been taken over by the Employer. All security organizations of the construction site are the responsibility of the Contractor.

During the operation period, the Contractor shall be responsible for the safety of the new WTE facility. After operation period the facility shall be taken by the Employer.

All fences shall be constructed as shown in red hatched in **Figure 2**, shall be structurally adequate for the purposes required and shall be maintained throughout the entire construction period. All barriers and fences installed by the Contractor shall be completely removed on completion of the work. The Contractor shall keep the site clean and repair any damage that may be caused by him. The Contractor also shall supplement and extend the fence with suitable temporary fence in case of need for working close to the existing fence or removing this for a certain limited time.

Outdoor lighting around the office buildings and the car park area shall be installed by the Contractor.

During all construction activities carried out in the facility, it is necessary to comply with the procedures and principles specified in ASAT's Occupational Health and Safety Internal Directive (Attachment-1). At the same time, all the works in the field must be carried out in accordance with the policy, objectives and procedures of the institution's ISO 9001 Environmental Management System and ISO 14001 Quality Management System. Hurma Wastewater Treatment Plant area is surrounded by a garden wall and wire mesh, and the facility has a single entrance and exit point.

The construction site shown to the Contractor for maintenance, production, storage, repair and accommodation works in the construction site shall have a separate entry-exit point. Personnel who works on the construction site, tools, equipment, work machines, etc shall use this entry-exit point.

The Contractor is obliged to ensure the environmental safety of the construction site, property safety and life safety of employees. The Contractor must place warning signs regarding occupational safety and construction site security in visible places on the construction site. A board should be placed at the entrance of the construction site where information such as the name of the job, the Employer, the sheet number, the names of the producer company or companies, the names and titles of the technical responsible, and the estimate price of the job are written. Considering the size of the work to be done, it should be determined that the average and maximum number of workers and technical staff shall work at the construction site, how many of them shall remain at the construction site, and according to the numbers found, the workers' resting, eating, undressing and dressing, sleeping, toilet places, etc should be determined too. The installation of the places must be done by the Contractor.

Transportation, food, accommodation, etc for the personnel who will work at the construction site but shall not stay in it. All operations shall be covered by the Contractor.

Signboard

As soon as possible after the Contractor has been given access to site, the Contractor shall provide, erect and maintain a signboard bearing:

- The Financier's name;
- The Employer's name;
- The Employer's Representative's name;
- The Contractor's name;
- The Project name and
- such other information as the Employer's Representative may direct to be inserted upon it.

The signboard shall be not less than 2.5m x 2.5m lettered in Turkish and English. The Contractor shall remove the signboard from the site on completion of the works.

Waste management

The waste generated at the construction site must be managed in accordance with the provisions specified in the Waste Management Regulation. The Contractor must supply the necessary containers for the collection of waste and determine a suitable waste collection area.

All expenses necessary for transportation of excavation soil, construction and rubble waste from the construction site to the disposal point belong to the Contractor.

Transportation of excavation soil and construction and demolition waste is the responsibility of the Contractor. The Contractor must comply with the Regulation on the Control of Excavation Soil, Construction and Demolition Waste.

Kızıllı Solid Waste Landfill Area of Antalya Metropolitan Municipality shall be used as the storage of the excavation area. The disposal cost shall be determined according to the agreement between the Antalya Metropolitan Municipality and the Contractor. The Solid Waste Landfill Area is located approximately 40 km from the Construction Site.

Safety Boards

The Contractor shall install steel or reinforced concrete panels preventing human entry throughout the construction area wherever construction is carried out. The dimensions of the safety panels shall be 2,00m x 2,00m and shall be placed around the construction site and shall be free-standing to prevent collapse. If required, steel bridges shall be constructed between the panels for human passage. In this regard, work shall be carried out in accordance with AYKOME regulations and the necessary warning signs shall be provided by the Contractor and placed in the necessary places. (The Contractor shall not be paid an additional fee for the supply of the Contractor's safety panels and equipment, warning signs, etc., and the supply of such equipment should be considered within the mobilization price evaluation and prospective Contractors shall be considered to submit their offers considering this situation).

1.3.7. Topographic and Geotechnical Survey

The geotechnical investigation report has been prepared and attached as a separate document to bidding documents (see Attachments-2a and 2b).

Base map drawings that show the existing topographic structure and ground levels has been attached as a separate document to bidding documents as well (see Attachment -3).

The Contractor is responsible to carry out additional soil investigations under agreed contract price if deemed necessary.

It is deemed that the Bidder is aware of the existing site conditions before submitting their technical bid.

It is expected that the Bidder should prepare their designs and constitute a construction methodology for all kinds of works such as ground excavation, static calculations, ground improvement and dewatering, steel construction works, etc., depending on the topographic information and drawings specified in this section.

1.3.8. Meteorological Status

Climate and Meteorological Data

The climatic conditions in Antalya shows big variations because the city is located on the Mediterranean Sea with line coast of 640 km. There are differences in conditions such as temperature, precipitation, and evaporation between various parts of Antalya Province due to physical geography factors such as proximity to the sea (inland), altitude difference, and features of geographical formations that affect climate elements.

In the province of Antalya, the fact that the mountains are mostly in the west-east direction, prevents the marine effects from reaching to the inner parts in these areas. Therefore, the lack of humidity in the inner regions causes a continental climate. The altitudes in Antalya increase from south to north. This situation, which leads to significant decreases in temperature distribution, causes the interior and especially the eastern parts of the province to be colder than the western parts.

When the characteristics of the climate factors are evaluated together, it is seen that summer is hot and dry. Although winter is generally rainy, the temperatures in the interior areas are lower than those close to the coastline in this season, and frosts occur mostly.

Generally the typical Mediterranean climate is dominant in the city centre and coastal districts of Antalya. The construction area is in the city center and located between the sea and the mountain.

The average temperature in the coastal areas is around 17-19°C in winter, lowest temperature in winter season is around 2-5 °C. However, in summer season average temperature is around 30-35°C and highest temperature is around 42-45 °C.

As a result of the climate change effects in recent years floods and heavy rain conditions are being lived during the winter and autumn seasons. And forest wildfires is being also living. In this respect the Contractor should fore sign this natural disaster during the design, build and operation periods.

The table of natural disasters that occurred in the central district of Antalya province between 2000 and 2020 is presented below.

Table 1: Number of Disasters in Antalya Province Center District

Disaster	Number of Disasters
Flood	14
Wildfire	1100
Stormwater	57
Tornado	36
Storm	28

1.4. TECHNICAL STANDARDS AND APPLICABLE REGULATIONS

The Contract shall be executed in compliance with the below listed Directives and international Standards and norms and all other Directives and international Standards and Norms mentioned in other sections of the Bidding Documents.

The requirements in Turkish Standards (TS) or other Turkish regulations shall be applied to if they are stronger or specify higher quality than these Technical Specifications or standards referred to therein.

Any standard, which fulfils the same functionality and describing the same quality level or better, can replace any mentioned standards.

Special attention should be given to the fact that Antalya is located in the 2nd degree earthquake zone. All structures and buildings shall be designed to withstand earthquake loads in accordance with "Turkish Regulations for Constructions to be built in Seismic Areas". In addition, Turkish Building and Earthquake Regulations (2018), TS 500 and TS 498 shall be used in all structures.

National and international standards regarding the effects of waste, gas, PM (dust) emission, noise, etc. to be generated within the scope of the project shall be complied with national and international standards, and applicable legislation shall be performed. In this context, the national and international regulations that shall be applied during the execution of the Contract, but not limited to these, have been summarized below:

- Regulation on Waste Incineration, which effectuated after being published in the Official Gazette dated 06.10.2010 and numbered 27721.
- Regulation on Control of Packaging Wastes” which effectuated after being published in the Official Gazette dated 27.12.2017 and numbered 30283 (Amended O.G.: 13.03.2020-31067)
- “Regulation on Control of Waste Batteries and Accumulators” which was effectuated after being published in the Official Gazette dated 31.08.2004 and numbered 25569 (Amended O.G.: 23.12.2014-29214).
- “Waste Oil Management Regulation”, which was effectuated after being published in the Official Gazette dated 21.12.2019 and numbered 30985.
- “Regulation on Control of Waste Vegetable Oils” which was effectuated after being published in the Official Gazette dated 06.06.2015 and numbered 29378.

- “Environmental Impact Assessment Regulation”, which was effectuated after being published in the Official Gazette dated 25.11.2014 and numbered 29186 (Amended O.G.: 28.11.2019-30962)
- “Exhaust Gas Emission Control Regulation” which was effectuated after being published in the Official Gazette dated 11.03.2017 and numbered 30004.
- “Regulation on Control of End-of-Life Tires”, which was effectuated after being published in the Official Gazette dated 25.11.2006 and numbered 26357 (Amendment O.G.:11.03.2015-29292).
- “Regulation on the Monitoring of Greenhouse Gas Emissions”, which was effectuated after being published in the Official Gazette dated 17.04.2014 and numbered 29003 (Amended OG: 31.05.2017-30082)
- “Regulation on the Protection of Ground Waters Against Pollution and Deterioration” which was effectuated after being published in the Official Gazette dated 07.04.2012 and numbered 28257 (Amended O.G.: 22.05.2015-29363).
- ““Environmental Law” which effectuated after being published in the Official Gazette dated 11.08.1983 and numbered 18132 (Amended O.G.: 26.04.2006-5491)
- “Occupational Health and Safety Law No. 6331” which effectuated after being published in the Official Gazette dated 30.06.2012 and numbered 28861.
- “Occupational Health and Safety Risk Assessment Regulation” which effectuated after being published in the Official Gazette dated 29.12.2012 and numbered 28512.
- “Regulation on Buildings to be Built in Earthquake Zones” which effectuated after being published in the Official Gazette dated 06.03.2007 and numbered 26454.
- “Regulation on Incineration of Wastes” which effectuated after being published in the Official Gazette dated 06.10.2010 and numbered 27721. (Amended O.G.: 07.04.2017-30031)
- “Regulation on Water Pollution Control” which effectuated after being published in the Official Gazette dated 31.12.2004 and numbered 25687 (Amended O.G.: 14.01.2020 - 31008)
- “Regulation on Control of Odor Emissions” which effectuated after being published in the Official Gazette dated 19.07.2013 and numbered 28712.
- “Regulation on General Principles of Waste Management” which effectuated after being published in the Official Gazette dated 05.07.2008 and numbered 26927.
- “Regulation on the Control of Industrial Air Pollution” which effectuated after being published in the Official Gazette dated 03.07.2009 and numbered 27277. (Amended O.G.: 20.12.2014-29211)
- “Regulation on Air Quality Assessment and Management” which effectuated after being published in the Official Gazette dated 06.06.2008 and numbered 26898.
- “Regulation on Control of Air Pollution Caused by Heating” which effectuated after being published in the Official Gazette dated 13.01.2005 and numbered 25699.

- “Regulation on Noise Emission in the Environment Generated by Outdoor Equipment” which effectuated after being published in the Official Gazette dated 30.12.2006 and numbered 26392.
- “Regulation on Protection of Employees from Noise Related Risks” which effectuated after being published in the Official Gazette dated 28.07.2013 and numbered 28721.
- “Regulation on Protection of Employees from Risks Related to Vibration” which effectuated after being published in the Official Gazette dated 22.08.2013 and numbered 28743.
- “Regulation on Health and Safety Conditions in the Use of Work Equipment” which effectuated after being published in the Official Gazette dated 25.04.2013 and numbered 28628.
- “Regulation on Control of Excavation Soil, Construction and Demolition Wastes” which effectuated after being published in the Official Gazette dated 18.03.2004 and numbered 25406.
- “Environmental Permit and License Regulation” which effectuated after being published in the Official Gazette dated 10.09.2014 and numbered 29115. (Amended O.G.: 06.11.2020-31296)
- “Regulation on Environmental Inspection” which effectuated after being published in the Official Gazette dated 21.11.2008 and numbered 27061. (Amendment O.G.: 16.08.2011-28027).
- “Regulation on Control of Waste Oils” which effectuated after being published in the Official Gazette dated 30.07.2008 and numbered 26952.
- “Regulation on Inventory and Control of Chemicals” which effectuated after being published in the Official Gazette dated 26.12.2008 and numbered 27092.
- “Regulation on Soil Pollution Control and Point Source Contaminated Sites” which effectuated after being published in the Official Gazette dated 08.06.2010 and numbered 27605. (Amended OG: 11.07.2013-28704).
- “Regulation on Control of Pollution Caused by Hazardous Substances in Water and Environment” which effectuated after being published in the Official Gazette dated 26.11.2005 and numbered 26005 (76/464/EU)
- “Regulation on the Prevention of Major Industrial Accidents and Mitigation of Their Effects”, which was effectuated after being published in the Official Gazette dated 02.03.2019 and numbered 30702.
- “Regulation on Evaluation and Management of Environmental Noise”, which was effectuated after being published in the Official Gazette dated 04.06.2010 and numbered 27601 (Amended O.G.: 27.04.2011-27917, 08.11.2015-29536).
- “Regulation on the Control of Major Industrial Accidents” which was effectuated after being published in the Official Gazette dated 30.12.2013 and numbered 28867.
- “Regulation on Technical Instructions on Air Quality Control (TA-Luft)”

- “Regulation on Protection of Buildings from Fire” which was effectuated after being published in the Official Gazette dated 19.12.2007 and numbered 26735.
- Continuous Emission Monitoring Systems (CEMS) Communiqué” which was effectuated after being published in the Official Gazette dated 12.10.2011 and numbered 28082.

1.4.1. EU Directives

- Pressure Equipment Directive 97/23/EC on the approximation of the laws of the Member States concerning pressure equipment.
- Machinery Directive 89/392/EEC with amendments: 91/368/EEC, 93/44/EEC, 93/68/EEC on the approximation of the laws of the Member States relating to machinery. Consolidated Directive 98/37/EC with amendment 98/79/EC.
- Low Voltage Directive 73/23/EEC.
- EMC Directive 89/336/EEC
- ATEX Directive 94/9/EC and 1992/92/EC
- EU Waste Framework Directive 2008/498/EC
- EU Hazardous Waste Directive 1991/689/EEC (Amended: 1994/31/EC)
- EU Waste Incineration Directive 2000/76/EC
- EC Waste Framework Directive 2008/498/EC

1.4.2. International Standards and Norms

Machinery Directive:

- EN ISO 12100 Safety of Machinery – General Principles for Design – Risk Assessment and Risk Reduction
- EN ISO 13850 Safety of Machinery – Emergency Stop Function – Principles for Design
- EN 60204-1 Safety of Machinery – Electrical Equipment of Machines – Part 1: General Requirements

Relevant IEC publications and Norms:

- IEC 60073 Basic and Safety Principles for Man-machine Interface, Marking and Identification - Coding Principles for Indication Devices and Actuators
- IEC 60204-1 Safety of Machinery - Electrical Equipment of Machines
- IEC 61439-1 (BS EN 61439-6) Low-voltage Switchgear and Control gear Assemblies
- IEC 60947 Low-voltage Switchgear and Control gear
- IEC 60255 Measuring Relays and Protection Equipment
- IEC 61131 Programmable Controllers
- IEC 61082 Preparation of Documents used in Electrotechnology
- IEC 60617 Graphical Symbols for Diagrams
- IEC 61000 Electromagnetic Compatibility

- IEC 60076, Power Transformers
- IEC 60364, Low-voltage Electrical Installations
- EN 62305, Protection Against Lightning
- EN 12255, Wastewater Treatment Plants
- EN 752, Drain and Sewer Systems Outside Buildings – Sewer System Management
- EN14122, Safety of Machinery – Permanent Means of Access to Machinery
- Machine safety – Safety related components of control systems EN 954-1
- HSE Guide (Health and Safety Guide) 847/9
- Industrial thermo-process equipment EN 746-1/2
- Definition of explosive area EN 50281-3
- Explosive atmospheres – explosion prevention and protection EN 1127-1
- Electrical equipment not intended for use in potentially explosive atmospheres EN 13463
- Machine safety – Principles of risk assessment EN 1050
- Dust Fires and Dust Explosions; Hazards – Assessment and Protection VDI 2263
- IEC 61508 and 61511
- National Fire Protection Association codes and standards NFPA – USA

All designs, materials, installations, services, and equipment required during the contract shall comply with the latest version as of the contract date of the applicable international standards or equivalents recognized in the industry, including ISO, EN, or Turkish application regulations, legislation, regulations, and specifications unless otherwise specified or approved. The Contractor is responsible for identifying and reporting any conflicts between the requirements of the contract and any regulations and standards used in the design of the facility (including those used by subcontractors) to the Employer's representative. All costs arising from fulfilling the requirements of local regulations and standards shall be borne by the Contractor. In case of contradictions in the standards, unless otherwise approved or requested by the Employer, the following hierarchy shall be applied and shall prevail:

1. Turkish standards
2. EU and/or International standards

The standards specified in the bidding documents; materials and equipment for which no standards are specified in the contract shall comply with at least one of the following standards and regulations in order of priority unless otherwise approved by the Employer's representative:

1. Turkish standards
2. EU and/or International standards

In the event that it is determined that the standard referenced in the contract has been withdrawn and cancelled, the Contractor shall be subject to the standard that comes into force in its place or another equivalent standard by the relevant authority. If the Contractor wishes to use an alternative standard, that standard shall be subject to the Employer's approval. In any case, standards accepted by Türkiye,

the EU, and the US shall be accepted. The Contractor may use alternative standards only with the approval of the Employer's representative and only after presenting sufficient evidence that the proposed standard meets or exceeds the requirements of the specification. The Contractor shall clearly specify the standards they intend to apply in the quality assurance plan and design submissions prepared for review by the Employer's representative. The Contractor shall also be responsible for ensuring that their subcontractors comply with the requirements of this clause. In cases where facility items are subject to multiple standards, the Contractor shall propose a single project standard, the justification for which shall be documented based on evidence and subsequently approved by the Employer's representative to be used as the project standard.

The Contractor shall ensure full compliance with the Regulations, Directives, and Legislation provided during all design, manufacturing, construction, and operation phases of the Integrated Facility. Changes made to the Laws, Regulations, and Directives over time shall be taken into account, and their current versions shall be used.

1.4.3. Fluidized Bed Incineration Unit (FBI) Standards

The standards referenced in the design, manufacturing, installation, and commissioning processes of the Fluidized Bed Incineration Unit and related equipment are listed below:

- ABMA, AFBMA, AGMA
- AISI
- AISI 325, Steel Construction Manual.
- ANSI
- ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings
- ANSI S5.1, CAGI-Pneurop Test Code for Measurement of Noise from Pneumatic Equipment
- ASME
- ASME, PTC 10, DIN 2045, Test Code for Compressors and Exhaust Equipment
- ASME, PTC 11, Test Code for Fans
- ASTM, BS, DIN, ISO
- AWS
- AWS D1.1/D1.1M, Structural Welding Code-Steel
- Institute of Electrical and Electronics Engineers (IEEE)
- National Electrical Code
- NEMA, IEC

1.4.4. Waste Heat Steam Boiler Standards

The Waste Heat Boiler and related equipment shall be constructed in accordance with the codes and standards specified below in **Table 2**.

Table 2: The Waste Heat Boiler and Related Equipments

Work	Relevant Standard
All waste heat steam boiler design and construction	ASME Kazan and Pressure Vessel Code, Sections I, II, VII Part I, and Section IX; ASTM standards; EEI standards; applicable FM standards; NFPA standards; relevant TSE, BS, EN pressure vessel standards
Control system logic	ASTM standards; NFPA standards; NFPA 8502, NFPA 8503; ISA standards, ATEX
valves	ANSI B1634, ASME B31.1, BS 1868, BS1873, BS5352 and related EN, DIN, TSE standards
Bending	ASME B&PV Code or ASME B31.1 as applicable, DIN EN 13480, relevant TSE standards
Steel Construction	AISC 316 Steel Construction Guide, BS 316S31, EN 1.4401
Test	ASME, PTC 4.4 Test Code, EN 12952-15, BS 845
Source	ASME and AWS D1.1/D1.1M, Structural Welding Code – Steel, BS EN 288, relevant TSE standards
Electricity	IEEE National Electrical Code IEC/NEMA

1.4.5. Steam Turbine Generator Standards

The applicable standards for the Steam Turbine and Generator System are listed below.

- Control system logic – Relevant ASTM standards; relevant NFPA standards; NFPA 8502, NFPA 8503, current ISA standards
- Pipes – applicable ASME B&PV Code or ASME B31.1, DIN EN 13480, relevant TSE standards
- Valves – ANSI B16.34, ASME B.31., BS 1868, BS1873, BS5352 and relevant EN, DIN, TSE standards
- INC, AISC 316 Steel Construction Handbook, BS 316S31, EN 1.4401
- Welding – ASME and AWS D1.1/D1.1M, BS EN 288, relevant TSE standards
- Testing – ASME, PTC 6, BS EN 60953, DIN 1943, IEC 953 Alternative Test Code
- Structural Welding Code – Steel
- Electrical – Current ASTM standards; current NFPA standards; NFPA 8502, NFPA 8503, current ISA standards, relevant European or Turkish standards
- IEEE-242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
- IEEE-122 Recommended Practice for Functional and Performance Characteristics of Control Systems for Steam Turbine-Generator Units
- IEEE-1547 Standard for Interconnecting Distributed Resources with Electric Power Systems

- National Electrical Manufacturers Association
- National Electrical Code
- ASME SA335, EN 10216-2, DIN 17175 Specification for Seamless Alloy Steel Pipe for High-Temperature Service
- ASME SA106, EN 10216-2, DIN 17175, BS 3059-440, BS 3602-430 Specification for Seamless Carbon Steel Pipe for High-Temperature Service
- ASME A213, DIN 17456/58, EN 10216-5, BS3606 Standard Specification for Seamless Alloy Steel and Austenitic Stainless-Steel Boiler, Superheater, and Heat Exchanger Tubes
- ASTM A217 Standard Specification for Steel Castings, Martensitic Stainless and Alloy Parts for High-Temperature Service
- ASTM A234, DIN 1.5415, 1.7335, 1.7380, 1.7362, 1.490, DIN EN 10213 Standard Specification for Forged Carbon Steel and Alloy Steel Pipe Fittings for Medium and High-Temperature Service
- ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength Structural Bolts
- ASTM A132 Standard Specification for Ferromolybdenum
- UL 6 UL Standard for Safety for Electric Metallic Tubing – Steel
- ANSI C80.1 Rigid Steel Conduit
- UL 306 UL Standard for Safety for Liquid tight Flexible Steel Conduit
- UL 514B UL Standard for Safety for Conduit, Tubing, and Cable Fittings
- ASME Section VIII, Commentary
- NEMA MG 1-1.65 Motors and Generators

1.4.6. Fire Standards

All work related to fire safety in the facility to be established shall comply with the standards listed below.

- EN 54 - Fire detection and fire alarm systems,
- EN 671 - Fixed systems for firefighting,
- ISO 6182 - Fire protection - Automatic sprinkler systems,
- ISO 6183 - Fire protection equipment – Design and installation of gaseous extinguishing systems suitable for use in facilities,
- ISO 6790 - Fire protection and firefighting equipment - Graphical symbols for fire protection plans,
- ISO 7240 - Specifications for fire detection and alarm systems.

1.4.7. Standards, Rules and Regulations for Electrical Works

All materials to be used in the facility must be produced in compliance with at least one of the TSE/IEC/EN/VDE/DIN standards.

- For all materials used in the facility, compliance with TSE/IEC/EN standards, ISO 9000 series, and the possession of a CE certificate shall be required. For materials without a

TSE standard, a TSEK certificate shall be sought. For matters not specified in the specification, the priority order shall be IEC, EN, TSE.

- The facility's grid connection shall be established in accordance with all relevant regulations, notifications, decisions, and application principles.
- The Contractor shall comply with all current legislation and the decisions/connection agreements/working principles of relevant institutions (such as the Authorized Local Distribution Company and TEDAŞ) in all tasks and processes.
- At the facility's grid connection point, the Contractor shall ensure, without any additional cost, compliance with all criteria (such as distribution, generator, autoproducer criteria, protection, control, grounding, meters, measurement, and connection points) required by the Employer, Regional Distribution Company, and TEDAŞ.
- The contract shall be executed in accordance with the directives, norms, and standards listed in the General Section, below, and elsewhere in this specification.

Table 3: The Directives, Norms and Standards

SCOPE	Subject for Standard	No of the Standard	Equivalent
SWITCHES	Low voltage switching and control units	EN 60439-1	TS 3367
SWITCHES	Switches for fixed electrical installations such as houses or similar places	EN 60669-1	TS 4915
SWITCHES	Switches - Part 1: General rules for electrical equipment	EN 61058-1	TS 1472
LIGHTING	Lighting fixtures - Part 2: Special rules	EN 60598-2-1	TS 8698
LIGHTING	Lighting fixtures for road and street lighting	EN 60598-2-3	TS 8700
LIGHTING	Fixtures for road and street lighting	EN 60598-2-3	
LIGHTING	Lighting fixtures - Part 1: General rules and tests	EN 60598-3	TS 8699
BUSBAR	Busbars	EN 13601	
BUSBAR	Temperature rise for busbars	IEC 298	
DISTRIBUTION CENTERS	MV-LV prefabricated transformers and distribution centers	EN 61330	TS 61330
POLES	Concrete poles		TS 997
FLOORING	Raised flooring systems	EN 12825	TS 12825
ELECTROMAGNETIC COMPATIBILITY	EMC compatibility and compliance with fluctuations	EN 61000-4-34	
ELECTROMAGNETIC COMPATIBILITY	Electromagnetic Compatibility	EN 61800-3	
GALVANIZATION	Hot-dip galvanized coatings on fabricated iron and steel products	BS EN ISO 1461	

GALVANIZATION	Hot-dip galvanizing for iron and steel building materials	EN ISO 1461	TS 914
GENERAL ISSUES	Environmental conditions, condensation limits	IEC 60068-2-2	
GENERAL ISSUES	Use in weather-protected locations	IEC 721-3-3	TS 60721-3-3
GENERAL ISSUES	Authorized services - Rules for alarm devices		TS 12849
SAFETY	Safety in machinery - Electrical equipment of machines	EN 60204	
SAFETY	Electrical equipment of machines	EN 60204-1	
HARMONICS	EMC and harmonic limits	IEC 61000-3-12	
CONDUCTORS	Overhead cable conductors, round concentric stranded conductors	EN 50182	TS 50182
CONDUCTORS	Overhead cable conductors	EN 50183	TS 9612
INSULATORS	Support insulators for overhead cables above 1000 volts	EN 60383-1	TS 60383-1
INSULATORS	String insulators for overhead cables above 1000 volts	EN 60383-2	TS 60383-2
INSULATORS	Indoor-outdoor support insulators for voltages above 1000 volts	IEC 273	TS 2042
CABLES	Thermoplastic insulated cables	HD 21-1 S4.	TS 9756
CABLES	PVC insulated cables with nominal voltages up to 450/750 V	IEC 60227	
CABLES	Conductors of insulated cables	IEC 60228	
CABLES	Cabling in AC and DC systems	IEC 60364	
CABLES	Extruded solid dielectric insulated power cables for voltages from 1 kV to 30 kV	IEC 60502	
CABLES	Extruded solid dielectric insulated power cables for voltages from 1 kV to 30 kV		TS 11178
CABLES	Copper conductors for braided overhead cables		TS 3
CABLES	Copper wire for electrical uses - hard drawn		TS 2
CAPACITORS	Capacitors	EN 60931-1	TS 30391-1
CAPACITORS	Capacitors for AC systems with rated voltages up to and including 1000 V	IEC 60831-1	

PROTECTION RELAYS	Protection Relays	IEC 61850	
PROTECTION RELAYS	Protection Relays Communication Protocol	IEC 60870-5-103	
MEASUREMENT TRANSFORMERS	Instrument transformers - Part 2: Voltage transformers	IEC 61869-2 and -3	TS 718
GENERAL ISSUES	Energy management systems	ISO 50001	
MEASUREMENT SYSTEM	Energy quality analyzers	EN 50160	
MEASUREMENT SYSTEM	Energy quality analyzers - Flicker measurement	IEC 61000- 4-15	
MEASUREMENT SYSTEM	Energy quality analyzers - Power quality measurement	IEC 61000- 4-30	
MEASUREMENT SYSTEM	Energy quality analyzers - Safety requirements for electrical devices for measurement, control, and laboratory use	IEC61010-1 (EN61010-1):	
MEASUREMENT SYSTEM	Energy quality analyzer - Measuring, testing, and signal generating device	UL61010B-1	
MEASUREMENT SYSTEM	Energy quality analyzer - General requirements, tests, and conditions for AC electrical measuring devices	IEC62052-11	
MEASUREMENT SYSTEM	Energy quality analyzer - EMC compliance and compatibility with fluctuations	EN 61000-2, 61000-3, 61000-4, 61000-5, 61000-6 and 61000-12	
MEASUREMENT SYSTEM	Electrical measuring devices and accessories	EN 60051-2	TS 5590
MEASUREMENT SYSTEM	Electrical measuring devices and accessories - Frequency meters	EN 60051-4	TS 5592
MEASUREMENT SYSTEM	Electrical measuring devices and accessories - Phase meters, power factor meters, and synchronization meters	EN 60051-5	TS 5594
MEASUREMENT SYSTEM	Meters for active energy in alternating current for accuracy classes 0.5, 1, and 2	EN 60521	TS 461
MEASUREMENT SYSTEM	Protection relays	IEC 60255	

MEASUREMENT SYSTEM	Electronic current transformers	IEC 60044-8	
MEASUREMENT SYSTEM	Industrial platinum resistance thermometers and platinum temperature sensors	IEC 60751	
MEASUREMENT SYSTEM	Industrial process measurement and control - Programmable controllers	IEC 61131-2,3	
MEASUREMENT SYSTEM	Electronic current transformers	IEC 61869-10	
MEASUREMENT SYSTEM	Electronic current transformers	IEC 61869-11	
MEASUREMENT SYSTEM	Measurement and limits of voltage fluctuations and associated light flicker	IEEE 1453-2004	
MEASUREMENT SYSTEM	General requirements for the competence of testing and calibration laboratories	ISO 17025	
MEASUREMENT SYSTEM	Procedures for temperature and irradiance corrections to measured I-V characteristics	UNE EN 60891	
MEASUREMENT SYSTEM	Electrotechnics, terms and explanations for measurement transformers		TS 7032
PANELS	Low voltage switchgear and controlgear assemblies	EN 61439	
PANELS	Low voltage switchgear and controlgear assemblies	EN 61439-1	TS 61439-1
SWITCHGEAR	Internal compartmentalization of cells/panels	EN 62271-200	TS 62271-200
SWITCHGEAR	Panels	IEC 62271-200	
SURGE ARRESTERS	Gap-type lightning arresters with variable resistance	EN 60099-1	TS 464
RECTIFIERS	Rectifier Group	IEC 60335-1	
FUSES	High voltage current-limiting fuses	IEC 60282-1	
TESTING	Test methods for electrical apparatus for detecting flammable gases	BS EN 50194-1	
GROUNDING	Grounding switches	IEC 62271-102 (class: MO, E1)	
TRANSFORMERS	Transformer regulations and standards	EN 60076-11	

TRANSFORMERS	Temperature rise for liquid-immersed distribution transformers	EN 60076-2	TS 10901
TRANSFORMERS	Distribution transformers - Insulation levels, dielectric tests, and external clearances in air	EN 60076-3	TS 10902
TRANSFORMERS	Application rules for power transformers	EN 60076-8	IEC 606.214.542
TRANSFORMERS	Dry-type transformers	HD 464 S1/A2	
TRANSFORMERS	Three-phase dry-type distribution transformers	HD 538	
TRANSFORMERS	Measurement of winding resistances for distribution transformers	IEC 60076-11 Clause 14.2.1	
TRANSFORMERS	Voltage ratio measurement and phase displacement test for distribution transformers	IEC 60076-11 Clause 14.2.2	
TRANSFORMERS	Measurement of short-circuit impedance and load loss for distribution transformers	IEC 60076-11 Clause 14.2.3	
TRANSFORMERS	Measurement of no-load loss and current for distribution transformers	IEC 60076-11 Clause 14.2.4	
TRANSFORMERS	Applied voltage test for distribution transformers	IEC 60076-11 Clause 14.2.5	
TRANSFORMERS	Induced voltage withstand test for distribution transformers	IEC 60076-11 Clause 14.2.6	
TRANSFORMERS	Partial discharge voltage withstand test for distribution transformers	IEC 60076-11 Clause 14.2.7	
TRANSFORMERS	Full-wave lightning impulse test for distribution transformers	IEC 60076-11 Clause 14.3.1	
TRANSFORMERS	Temperature rise test for distribution transformers	IEC 60076-11 Clause 14.3.2	
TRANSFORMERS	Sound level measurement test for distribution transformers	IEC 60076-11 Clause 14.4.2	
TRANSFORMERS	Insulating liquids - Dielectric breakdown voltage at power frequency test	IEC 60156	TS 3989
TRANSFORMERS	Dry-type transformers	IEC 60726	TS 7451
TRANSFORMERS	Loading guide for dry-type distribution transformers	IEC 60905	TS 60905
TRANSFORMERS	Loading rules for dry-type transformers	IEC 60905	TS 60905

TRANSFORMERS	Instrument transformers - Part 1: Current transformers	IEC 61869-2	TS 620
TRANSFORMERS	Distribution transformers	IEC 76	TS 267
TRANSFORMERS	Noise level measurement for transformers and reactors		TS 8711
TRANSFORMERS	Transformers		TS 7451
TRANSFORMERS	Distribution transformers - Dry-type	IEC-60076	
FIRE DETECTION	Fire detection and alarm systems - Manual call points	EN 54-11	
FIRE DETECTION	Fire detection and alarm systems - Smoke/optical beam detectors	EN 54-12	
FIRE DETECTION	Fire detection and alarm systems - Compatibility and connectability of system components	EN 54-13	
FIRE DETECTION	Fire detection and alarm systems - Short circuit isolators	EN 54-17	
FIRE DETECTION	Fire detection and alarm systems - Input/output devices	EN 54-18	
FIRE DETECTION	Fire detection and alarm systems - Fire alarm devices. Visual alarm devices	EN 54-23	
FIRE DETECTION	Fire detection and alarm systems - Fire alarm devices. Sounders	EN 54-3	
FIRE DETECTION	Fire detection and alarm systems - Power supply equipment	EN 54-4	
FIRE DETECTION	Fire detection and alarm systems - Heat detectors. Point heat detectors	EN 54-5	
FIRE DETECTION	Fire detection and alarm systems - Smoke detectors	EN 54-7	
FIRE DETECTION	Fire detection and alarm systems standards	TSE CEN/TS 54-14	
HIGH VOLTAGE SWITCHGEAR	Circuit breakers in residential or similar installations to prevent overcurrents	EN 60898	TS 5018
HIGH VOLTAGE SWITCHGEAR	High voltage switches - Part 100: High voltage alternating current circuit breakers	EN 62271-100	TS 62271-100
HIGH VOLTAGE SWITCHGEAR	HV switchgear - High voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	EN IEC 62271-102:2018	

HIGH VOLTAGE SWITCHGEAR	Power Circuit Breakers (for rated voltages higher than 1 kV and lower than 52 kV)	IEC 60265	
HIGH VOLTAGE SWITCHGEAR	High voltage fuses	IEC 60282-1	
HIGH VOLTAGE SWITCHGEAR	High voltage fuses - Part 1: Current-limiting fuses	IEC 60282-1:2020	
HIGH VOLTAGE SWITCHGEAR	High voltage fuses - Part 2: Expulsion fuses	IEC 60282-2:2008	
HIGH VOLTAGE SWITCHGEAR	Power Circuit Breakers (AC, High voltage fuse-switch combinations)	IEC 60420	
HIGH VOLTAGE SWITCHGEAR	Power installations exceeding 1 kV AC - Part 1: General rules	IEC 61936-1:2021	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear	IEC 62271	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 1: Common specifications for alternating current switchgear and controlgear	IEC 62271-1:2017	
HIGH VOLTAGE SWITCHGEAR	Circuit breakers	IEC 62271-100	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 100: Alternating current circuit breakers	IEC 62271-100:2021	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	IEC 62271-102:2018	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 103: Switches for rated voltages above 1 kV and less than 52 kV	IEC 62271-103	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 105: Alternating current switch-fuse combinations (for rated voltages above 1 kV and up to 52 kV)	IEC 62271-105:2021	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 106: Alternating current contactors, contactor-based controlgear, and motor starters	IEC 62271-106	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear	IEC 62271-200:2021	

	and controlgear for rated voltages above 1 kV and up to 52 kV		
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 213: Voltage detection and indication system	IEC 62271-213:2021	
HIGH VOLTAGE SWITCHGEAR	High voltage switchgear and controlgear - Part 215: Phase comparator used with VDIS	IEC 62271-215:2021	
HIGH VOLTAGE SWITCHGEAR	HV Switchgear - Insulation coordination	IEC EN 60071	
HIGH VOLTAGE SWITCHGEAR	HV Switchgear - Degrees of protection provided by enclosures (IP code)	IEC EN 60529:1991	
LIGHTNING PROTECTION	Lightning protection - Part 3: Physical damage to structures and life hazard	DIN EN 62305-3	
LIGHTNING PROTECTION	Lightning protection - Part 3: Physical damage to structures and life hazard	VDE 0185-305-3	
STARTERS	Low voltage switchgear and controlgear systems - Part 4: Contactors and Motor starters	EN 60947-1	TS 60947-4-1
STARTERS	Low voltage switchgear and control devices - Part 2: Circuit breakers	EN 60947-2	TS 1058
STARTERS	Low voltage switchgear and controlgear assemblies - Part 3: Switches, disconnectors, fuse combination units	EN 60947-3	TS 60947-3
STARTERS	Lighting fixtures - Part 1: General rules and tests	EN 60947-4-1	TS 8697
STARTERS	Frequency Inverter	EN 61800-5	
STARTERS	Soft starter	EN60947-4-2	
STARTERS	Contactors for motor starters	IEC 158	
STARTERS	Frequency Inverter - Internal Safety STO Function	IEC 61508 SIL 3	
STARTERS	Adjustable speed electrical power drive systems	IEC 61800-5-1	

The system shall be designed, procured, manufactured, tested, and installed in accordance with the following laws, regulations, notifications, and directives:

- Electricity Market Law No. 6446
- Occupational Health and Safety Law No. 6331
- Labor Law No. 4857

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- Social Insurance and General Health Insurance Law No. 5510
 - Vocational Qualification Law No. 5544
 - Environmental Law No. 2872
 - International Workforce Law No. 6735
 - Industrial Zones Law (Law Amending the Industrial Zones Law and the Organized Industrial Zones Law)
 - Energy Efficiency Law
 - Building Inspection Law
 - Regulation on Preparing Electricity Internal Installation Projects
 - Electricity Facilities Project Regulation
 - Regulation on Electricity Internal Installations
 - Regulation on Electricity High Voltage Current Installations
 - Regulation on Grounding in Electrical Installations
 - Regulation on Lightning Protection
 - Regulation on Acceptance of Electrical Installations
 - Regulation on Electrical Installations Project and Acceptance
 - Procedures and Principles Regarding Acceptance Processes of Electrical Installations
 - Dimensions, Details, and Application Principles for Cable Shafts and Energy Rooms
 - Regulation on Occupational Health and Safety Services under Law No. 6331
 - Regulation on Duties and Responsibilities of Workplace Physicians under Law No. 6331
 - Regulation on Occupational Health and Safety in Construction Works
 - Disaster Management Regulation for Infrastructure
 - Energy Performance Regulation in Buildings
 - Procedures and Principles for LED Lighting Measurements
 - Regulation on Fire Protection of Buildings
 - Regulation Amending the Regulation on Fire Protection of Buildings
 - General Specification for Construction Works
 - Specification for Architectural and Engineering Services
 - TEDAŞ Technical Specification for Installation (Application) Procedures and Principles of Energy Cables in Electricity Distribution Networks
 - Relevant Sections of the Disaster Management Regulation for Infrastructure published in the Official Gazette dated February 15, 2007, No. 26435
 - TEDAŞ-MLZ/96-017.A Technical Specifications for Medium Voltage Disconnectors

- TEDAŞ-MLZ/96-019.A Technical Specifications for Metal Oxide Surge Arresters for Medium Voltage Systems
- TEDAŞ-MLZ/96-014 Technical Specifications for All-Aluminium Stranded Conductors and Aluminium Conductor Steel Reinforced (ACSR)
- TEDAŞ-MLZ/96-018.B Technical Specifications for Medium Voltage XLPE Insulated Power Cables
- TEDAŞ-MLZ/99-033.A Technical Specifications for Medium Voltage Cable Terminations and Accessories
- TEDAŞ-MLZ/99-032.E and TEDAŞ-MLZ/99-031.B Technical Specifications for Distribution Transformers
- TEDAŞ-MLZ/2003-006 Technical Specifications for Low Voltage Distribution Panels with Metal Enclosures
- TEDAŞ-MLZ/96-015.A Technical Specifications for 0.6/1 kV Low Voltage Power Cables
- EUB.02 External Type Fused Grounding Switch
- EUB.03 Surge Arresters
- EUB.04 Steel-Aluminium Swallow Conductor
- EUB.05 High Voltage Cables
- EUB.06 High Voltage Cable Terminations
- EUB.08 Metal-Clad Medium Voltage Modular Switchgear
- EUB.09 Distribution Transformer
- EUB.10 Transformer Low Voltage Panel
- EUB.11 Compensation Panel
- EUB.12 MCC Panels
- EUB.14 0.6/1 kV NHXMH Power, Control, and Signal Cables

1.4.8. Power Quality Analyzers

- IEC61010-1 (EN61010-1): Safety requirements for electrical equipment for measurement, control, and laboratory use.
- CSA C22.2 No 1010-1: Canadian Standards Association.
- UL61010B-1: Measurement, test, and signal generation equipment.
- IEC62052-11: Electricity metering equipment (AC) – General requirements, tests, and test conditions.

Electromagnetic Compatibility:

- IEEE C.37-90.1: Surge Withstand Capability (SWC) Tests for Protection Relays and Relay Systems (ANSI).
- IEC1000-4-2: Electrostatic Discharge (B).

- IEC1000-4-3: Immunity to Radiated EM Fields (A).
- IEC1000-4-4: Fast Transient Electrical Currents (B).
- IEC1000-4-5: Surge Immunity (B).
- IEC1000-4-6: Conducted Immunity.
- IEC1000-4-12: Damped Oscillatory Waves Immunity.
- IEC1000-3-2: Limits for Harmonic Current Emissions (device input current < 16 amps per phase).
- IEC1000-3-3: Voltage fluctuation and flicker limits for low-voltage supply systems (devices with nominal current < 16 amps).

Measurement Standards Compliance:

- IEC61000-4-30 Class A.
- IEC61000-4-7: Interharmonics.
- IEC61000-4-15: Flicker (20 PST precision).

Accuracy:

- Must meet ANSI C12.20 accuracy class 0.2 requirements.
- Must comply with IEC62053-22 (Electricity metering equipment (AC) – Particular requirements – Part 22: Static meters for active energy, accuracy class 0.2S).
- Must comply with IEC62053-23 (Electricity metering equipment (AC) – Particular requirements – Part 23: Static meters for reactive energy, accuracy class 1).

1.4.9. Transformers

Transformers shall meet the following standards and regulations:

- IEC 60076-11: Climate C2, Environment E2, Fire behaviour F1.
- HD 464 S1
- HD 538.1 S1
- EN 60726
- VDE 0532
- ANSI C57.12.01
- DIN EN 50588-1

1.4.10. Installations in Explosive Atmosphere

All areas at the new Hurma WTE facility shall be classified in EX zones in accordance with the local law, ATEX directive and other related directives, norms and standards. The Contractor must have the classification approved by relevant local authorities.

The design, build and operation must be carried out in accordance with the ATEX directive and the approved classification. All components shall be selected in accordance with the ATEX directive guidelines related to equipment and protective systems intended for use potentially explosive atmospheres 94/9/EC (ATEX Guide).

In accordance with ATEX directives, zone calculations must be prepared in all construction area where flammable, explosive materials and gases, water vaporation are present and high pressure, high temperature conditions. Besides fire protection plan that shall be prepared and submitted to the Employer's Representative should also include ATEX requirements.

1.5. QUALITY ASSURANCE

1.5.1. General

In order to respond to the contract requirements in an optimal way, a quality assurance system shall be established.

The present section defines the following:

- The commitment of the Employer, the Employer's Representative, external controllers and the Contractor towards the quality of the Contract.
- The quality assurance plan to be prepared by the Contractor.

1.5.2. Standards and Recommendations

The Contractor shall make sure that the quality control complies with current Turkish standards and take guidance from the following international standards:

Table 4: International Standards

ISO 9000	Standards for the quality control and assurance - Guideline for selection and utilization
ISO 9001	Quality system - Model for the quality assurance in conception development, production, installation, and after-sales support
ISO 9002	Quality system - Model for the quality assurance in production and installation
ISO 9003	Quality system - Model for the quality assurance in controlling and final tests
ISO 9004	Quality control and element of the quality system – Guidelines
ISO 8402	Quality management and quality assurance – Vocabulary

TS EN ISO 50001:2018 Energy Management System (EnMS): Energy Management System Certification - ISO 50001 is an international standard that provides requirements to ensure efficiency in resource consumption, to minimize environmental impacts, and to improve energy use and consumption in order to get maximum energy efficiency.

TS EN ISO 14001:2015 Environmental Management System Certification: ISO 14001 is an international standard that provides requirements to improve environmental performance through more efficient use of resources and to reduce amount of waste. During the period from procurement of the raw material until the final product, the main purpose is to determine environmental factors and minimize the damage to the environment by monitoring and controlling these factors.

TS ISO 31000:2018 Risk Management Certification: ISO 31000 is an international standard that provides principles and guidelines for identification, analysis, assessment, monitoring and management of risks in order to ensure more effective and efficient risk management by standardizing risk management process of the organization. This standard aims better risk management and continuity of work processes by improving the risk management process.

1.5.3. Quality Assurance Procedure

The compilation of the quality assurance procedure shall start when the Contractor submits the quality assurance plan, not later than 28 days after the Notice of Commencement Date or as defined in the Conditions of Contract.

The Contractor commits itself to the active participation in making the quality assurance procedures of the different sub-contractors close to and harmonizing with one another during the advancement of the design and performance of the works.

It is therefore required that the Contractor participates actively in the elaboration, and in respect of this quality assurance procedures, relying on all its internal competencies in the matter of quality control in the design phase, the implementation phase, understanding that the quality assurance procedure is implemented with the purpose of improving an existing system and not of substituting or doubling it.

The other group of people shall participate in meetings for the elaboration of the quality assurance procedure: the Employer, the Contractor, the Employer's Representative, external controllers and subcontractors.

The first meeting shall take place not later than 15 working days after the Employer's Representative receives the quality assurance plan from the Contractor.

1.5.4. Preparation of the Quality Assurance Plan

On the basis of the organisational scheme of the quality assurance procedure, the Contractor develops the quality assurance plan for this contract.

The Contractor has to write all arrangements for the quality assurance to be implemented by its own company, the subcontractor enterprises and the suppliers in a simple but exhaustive way.

The Contractor shall send it to the Employer, the Employer's Representative and external controllers as well as all contributors.

The Contractor makes the documents up-to-date (list of documents, indication of the revision in course, nature of validation, etc.) in order to assure their traceability.

Finally, the Contractor shall be responsible for keeping its quality assurance plan up-to-date in accordance with the quality assurance procedure and the events of the contract.

The quality assurance plan should contain at least the following:

- a) The application range of the quality assurance plan**
- b) Organization and personnel means**

The quality assurance plan specifies the general organisation of the contract with the help of the nominative organisation charts, which should indicate especially the following:

- The elaboration meetings of the quality assurance procedure;
- The contract progress meetings;
- The organisation of internal and external control;
- It describes the functions, attributions and responsibilities of the personnel on the contract and of the external control responsible; and
- It specifies the maximum percentage of the recourse of the temporary personnel.

c) Design control

The quality assurance plan especially indicates:

- The distribution of tasks among the sub-contractors;
- The nature of documents to be submitted;
- The procedures of identification of critical points and the stopping points of the concept; and
- The procedures for check of design and documentation.

d) Document control - traceability

The quality assurance plan especially indicates:

- The rules for the identification of documents;
- The rules for the circulation of the different documents produced; and
- The methods for the management of documents (distribution, classification, archiving).

e) Purchases

The quality assurance plan especially indicates:

- Lists of suppliers and subcontractors and associated benefits. The Contractor supplies the list of envisaged suppliers and subcontractors as soon as possible;
- The procedures of repercussion of the quality requirements of the Employer's Representative over the suppliers and the subcontractors; and
- The precise procedure of the evaluation of subcontractors.

f) Performance and test control

The quality assurance plan especially indicates:

- The list of documents and procedures written to define the modes of operation, the resources and the sequence of different activities;
- The procedures for the establishment of a list of critical and stopping points of the performance, controls and tests;
- The procedures for the internal delivery of subcontracted tasks;
- The procedures for the control of products delivered;
- The procedures for the controls and tests in course of the performance;
- The procedures for final controls and tests before the reception by the Employer's Representative; and
- The procedures for the management of controlling documents (distribution, classification, archiving).

g) Control of non-compliance

The quality assurance plan indicates the procedures for identification, evaluation and treatment of detected non-compliance.

h) Protection of the site equipment

The quality assurance plan indicates the procedures for establishing a list of equipment to be protected and descriptions of measures to be applied.

i) Annexes

- Design planning,
- Work planning and
- Directories of the sub-contractors

1.5.5. Quality Audits

The Employer's Representative can at all times audit the quality assurance procedure of the Contractor in the design or construction phase.

The audit is performed with reference to the quality assurance plan of the Contractor and on the basis of the quality assurance procedure.

The auditor establishes an audit report revealing the found gaps or non-compliance not later than three weeks after the performance of the audit.

Within a period of 10 working days counted from the date of the reception of the report, the Contractor indicates in writing the corrective actions it wishes to implement, their planning, and the name of the responsible of the control over these corrective actions.

The Contractor shall carry out the design and built works of the Hurma WTE facility in a complete and operationally ready manner in all aspects and operate the facility according to Operational and Maintenance Manuals that shall be prepared.

All design and built works shall be carried out according to Contractor's know-how technology that should be constitute within the frame of common and accepted engineering practices. All sections, equipment, systems, and auxiliaries works provided for the new Hurma WTE facility shall be designed, build and operated using proven methods, latest technology and the best available technical solutions.

1.6. PROJECT MANAGEMENT

1.6.1. General Methodology and First Work Program

The Contractor shall submit a detailed methodology explaining the construction stages, application details, necessary equipment and materials of the manufacturing to be carried out within the scope of the Contract.

A detailed work programme prepared realistically and in MS Project or similar format; It shall be prepared within 7 days from the date of the Commencement of Works and shall be submitted to the Employer's Representative for approval.

In the work programme, resources and critical path should be added to the work items and the region, number of teams and machinery park should be specified. In addition, a monthly money usage graph (S-curve) shall be delivered as the relevant program output.

1.6.2. Methodology for Special Works

The Contractor shall present the construction methodology 21 days before starting special works with the qualifications specified below.

- Drilling, etc.
- Any work that, in the opinion of the Employer's Representative, has a significant risk of delays and problems (due to the tourist season, seasonal conditions, etc.).
- Work that is excessively delayed according to the approved work schedule.

Within the scope of the methodology, issues such as how the Contractor shall carry out the construction, the equipment it shall provide and the distribution of materials shall be included, and it shall also include an evaluation of safety issues. All documents required for the work shall be presented together.

1.6.3. Construction Projects

Construction projects shall be duplicated by the Contractor in 5 hardcopies + 1 digital copy and delivered to the Employer's Representative before the start of site constructions.

1.6.4. Monthly Progress Reports and Work Programmes

The Contractor shall submit the Monthly Progress Report and Revised Work Program by the end of the 7th day of each month at the latest. The Contractor shall submit the report in three copies, detailing the progress made in the field during the month of manufacturing, the format and content of which shall be determined by the Employer's Representative. Additionally, this report shall state the activities to be done during the next month and each point related to those works. The report should ensure budget control and program management so that potential problem areas can be identified in advance and corrective measures can be taken to minimize the impact of problems on the business.

In addition to the report, a program shall be prepared giving the status of all engineering works, designs and drawings as of the end of the month. Reports shall be in writing and in a form approved by the Employer's Representative.

Monthly Progress Reports shall be discussed at progress meetings. The place, date and time of these meetings shall be agreed upon. However, it shall generally not be later than the 10th day of the month following the month to which the report relates.

The Contractor shall submit a Quarterly Work Progress Report every 3 (three) months, covering the past 2 (two) months. The format, content and number of presentations shall be determined and delivered by the Employer's Representative.

The report shall also include an updated version of the Contractor's Work Programme, thus showing how much progress has actually been made on each work, giving an idea of how long it shall take for the remaining works to be completed and showing changes at each stage of the works.

Monthly Progress Reports shall include:

- Detailed descriptions of progress, including each stage of design, procurement, manufacture, delivery to site, construction, erection, testing and commissioning,
- Charts showing the status of construction documents, purchase orders, manufacture and construction,
- For the manufacture of each main item of facility and materials, the name of the manufacturer, location of the manufacturer, percentage progress and the actual or expected dates of commencement of manufacture, Contractor's inspections, tests and delivery,
- Records of personnel and Contractor's equipment on site,

- Copies of quality assurance documents, test results, and certificates of materials,
- Safety statistics, including details of hazardous incidents and activities relating to environmental aspects and public relations and
- Comparisons of actual and planned progress, with details of any aspects which may jeopardize completion in accordance with the contract and the measures being (or to be) adopted to overcome such aspects,
- Updated Work Program,
- Updated cash flow for the remaining period,
- Photo documentation.

Submission of Monthly Work Progress Reports is a prerequisite for making progress payments to the Contractor.

The monthly work progress report should include the topics mentioned above but should not be limited to these topics.

Work Programs prepared by the Contractor in detail and realistically using MS Project or similar work program software shall be submitted to the Employer's Representative for approval in 3 copies, printed and digital.

General notes on the preparation of the Work Programme:

The work programme shall be prepared considering the preliminary design report deliverables, final design report deliverables, the date of completion of design-build works, commissioning period, the possible date of commissioning certificate, trainings, the Contractor's main equipment and personnel status, operation service period and shall be submitted together with the Methodology and Quality control documents for new productions, if any.

The scope of work, drawings, site conditions, existing plant conditions, work area, documents, regulations regarding the tourism season and working hours in this regard shall be examined in detail, the main manufacturing items and their timings shall be determined and a detailed work programme shall be prepared.

Material approval processes must be shown in the Work schedule.

All work items shall be listed and a detailed work programme shall be prepared, including the number of teams and machinery, taking into account the priorities.

1.6.5. Progress Photographs

The Contractor shall create a digital archive and submit it to the Employer's Representative within one (1) month to keep site records.

During the progress of construction, the Contractor shall ensure that he takes sufficient photographs to give a sufficient idea about the work done on the site and to prove that that part of the work has been completed and shall submit these photographs together with the Monthly Progress Report.

Upon completion of the construction, photographs showing the completion of the work on all lines and structures shall be taken by the Contractor and delivered in good quality colour printed and digital form. Digital copies (CD) shall be filed properly and attached to the Construction Completion Declaration with detailed information about where and when the photographs belong. There shall be 2 sets of printed forms. Photography expenses shall be borne by the Contractor.

1.6.6. Hazard and Operability Study (HAZOP)

The Contractor shall prepare and execute HAZOP studies, which are hazard and operability studies for the entire Hurma WTE Facility, to identify hazards and problems that may prevent the efficient and safe operation of the facility from the beginning of the design phase. The study shall also include LOPA Protection Layer Analysis.

HAZOP studies shall be executed by a team that includes a team leader, a secretary and a technician assigned by the Contractor and approved by the Employer's Representative. The team leader should have experience in occupational health and safety and knowledge and skills in HAZOP techniques. Other members of the HAZOP team may have but are not limited to, the experience on Employer's Representative, operation and maintenance representative, and design engineers from appropriate disciplines.

HAZOP studies shall be executed in accordance with the work program during the design, built period.

All the HAZOP actions shall be recorded by their team.

The HAZOP team shall be independent third party and the members of the team shall not be the same with the Key Personnels for design and built specified in GCC 1.1.21 & 6.9.

The Contractor's design, build team shall prepare the general requirements, heat and mass balance, and P&IDs prior to the HAZOP study. Following the approval of the general design requirements (calculation of heat and mass balance and preparation P&I diagrams and general layouts etc.) by the Employer's Representative. The Contractor shall forward them to HAZOP team.

HAZOP study shall include;

- Systematic analyses of the effects that can be occurred caused by the deviations of the physical and chemical parameters during the operation period
- Identification of possible potential problems and determination of proper remediation of them during the operation of the facility
- Measurements related to identification and evaluation of risks, specifications and applications of measures, usage of proper equipment and testing in accordance with the Classification of the Safety Integrity Level – SIL
- Preparation of error level analyses of the construction area and equipment, determination of error level and reflection of the error level on design parameters and requirements. If the HAZOP study is completed as negative, the designs and calculations should be reviewed and recalculated by the Contractor. A new HAZOP study shall be executed according to the revised calculations and designs.

1.6.7. Meetings

The Employer, Employer Representative, Contractor and, if necessary, third parties shall also attend the meetings to be held within the scope of the contract.

1.6.7.1. Pre-Design-Build Meeting

Prior to the commencement of works, a pre-design-build meeting shall be held at a mutually agreed time and place. The following parties shall attend the meeting:

- Contractor and Manager

- Subcontractor specified by the Contractor in their bid or approved during the manufacturing phase.
- Employer's Representative
- Employer
- Government representatives (when necessary)
- Employer, Employer's Representative and other persons deemed necessary by the Contractor

The purpose of the meeting is to identify responsible personnel and establish a working relationship. The Contractor shall submit to the meeting a draft programme for each of the following, unless previously submitted to the Employer's Representative. The meeting shall cover the following topics:

- Contractor's draft schedules design works
- Contractor's draft schedules construction works
- Submission, review and distribution of documents submitted by the Contractor
- Keeping registration documents
- Identifying critical tasks and establishing priority orders
- Field Decisions and Change Orders
- Use of facility, office and warehouse areas, security, maintenance and Employer's Requirements
- Major equipment deliveries and priorities
- Bedding-Lining and filling material, ready-mixed concrete, laboratory services
- Contractor's duties regarding safety, first aid and environmental protection

The Contractor; While examining the contract documents, he/she shall immediately notify the Employer and the Employer's Representative of any errors, defects and omissions that he/she notices in the design or specifications of the works or in the execution process of the works, together with reasonable technical and financial solutions for the necessary changes.

The Employer's Representative shall chair the meeting and ensure that meeting minutes are kept and distributed to participants.

1.6.7.2. Weekly Site Meetings

For the purpose of proper coordination of site activities, periodic and special site meetings shall be held upon the request of the Employer's Representative. The Contractor's Representative, the Employer and the Employer's Representative shall attend these meetings, or third parties may also attend upon the request of the Employer's Representative.

The Employer's Representative shall prepare the meeting minutes and give a copy to the Employer and the Contractor for their opinions. The parties must submit their opinions within five calendar days from the date of receipt of the minutes. If no opinion is expressed within this period, the minutes shall be considered to have been accepted by all parties.

If the Contractor does not send its representative(s) to the meeting requested to attend, all decisions shall be made as if the Contractor was present at the meeting, and if the Contractor does not express his opinion within the above-mentioned period, he shall be deemed to have accepted the instructions.

1.6.7.3. Monthly Site Meetings

The Contractor's Technical Office Engineer, Quality Control, Social and Environmental Expert, and Occupational Health and Safety expert shall also attend this meeting.

The agenda of the monthly construction site meetings shall be as follows:

- Occupational health & safety, social, and environmental compliance
- Summary of work done to date since the last meeting
- Progress according to work schedule
- Possible delays
- Contractor's resources
- Manufacturers, materials, testing and quality control
- Workmanship and quality
- Progress payment applications
- Cash flow
- Possible problems and suggested solutions
- Photo recordings

The Employer's Representative shall prepare the meeting minutes and give a copy to the Employer and the Contractor for their opinions. The parties must submit their opinions within seven calendar days from the date of receipt of the minutes. If no opinion is expressed within this period, the minutes shall be considered to have been accepted by all parties.

1.6.7.4. Coordination Meeting

A coordination meeting shall be held. All presentations regarding the work to be done at these meetings shall be prepared by the Contractor.

The Contractor is responsible for preparing the programs and drawings for the execution of the works according to the work schedule, without causing any delays, and obtaining permission/approval from the relevant institutions and/or authorities and their branches in accordance with the law.

A copy of the Contractor's proposals and a copy of the drawings shall be given to the Employer's Representative before being delivered to the relevant institutions and/or authorities and their branches.

1.6.8. Daily Record

The Contractor shall prepare a Daily Record Form for the day worked in the format specified by the Employer's Representative on a daily basis and submit this registration form to the Employer's Representative by 10:00 in the morning of the next working day.

This report shall include:

- Number of workers employed.
- Records of materials and goods brought to the construction site.
- Working Machines (excavator-tractor bucket, truck, mobile crane, water tanker, welding machines-generator, etc.)

- Description of production and general conditions (weather etc.)
- Situations that prevent working

1.6.9. Key Personnel

The titles and required experiences of key personnel to be assigned under the contract are specified in the bidding document, **Section IV – Bidding Forms, Form PER-1: Contractor's Representative and Key Proposed Personnel**.

The requirements for similar work experience for key personnel are specified below.

Requirements for Design Phase Key Personnel:

Project Manager should have minimum. 10 years of general experience, 5 years of similar experience on project management and/or site management related to below mentioned subjects;

- wastewater treatment projects with sludge disposal such as sludge drying and or sludge incineration and/or sludge digestion and or energy recovery,
and/or,
- incineration and/or drying projects and /or energy production projects related to waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Project Manager should have complete at least 1 (one) project in incineration plant/ waste to energy facility or equivalent.

Design Expert should have minimum 10 years of experience, 5 years of similar experience on below mentioned subjects;

Thermodynamic Calculation and design preparation experience of Sludge and/or waste incineration facility with energy recovery unit and emission control unit under below four main criteria;

- (1) waste/sludge incineration (expertise in combustion thermodynamics, furnace and boiler design, etc.)
- (2) waste/sludge drying (heat transfer, drying technologies, and process integration know-how, etc.)
- (3) emission control (specific knowledge of flue gas cleaning systems, filtration, emission standards, and environmental regulations, etc.)
- (4) energy production and recovery (experience in steam turbines, cogeneration, heat exchangers, and energy efficiency optimization, etc.)

If a single design expert has not experience on above mentioned all criteria, design experts can be submitted separately. The proposed design expert and/or experts will be evaluated individually above four main experiences criteria. Above-mentioned “minimum years of experiences” should be complied by proposed expert(s).

Mechanical and Electrical and Automation Engineers should have experience on sludge/waste drying and or sludge/waste incineration and /or energy production and recovery from waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Civil Engineer, Cost and Quality Expert and Technical Office Manager should have experience on international project in the relevant field of expertise.

Requirements for Build (Construction) Phase Key Personnel:

Project Manager should have minimum. 10 years of general experience, 5 years of similar experience on project management and site management related to below mentioned subjects;

- wastewater treatment projects with sludge disposal such as sludge drying and or sludge incineration and or sludge digestion and or energy recovery,
- and/or,
- incineration and/or drying projects and /or energy production projects related to waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Project Manager should have complete at least 1 (one) project in incineration plant/ waste to energy facility or equivalent.

Mechanical Engineer, Electrical Engineer, SCADA Automation Engineer, and Construction Chief /Site Manager should have experience on construction of sludge/waste drying and or sludge/waste incineration and /or energy production and recovery from waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Environmental and Social Experts, Health and Safety Expert, Civil Engineer, Cost and Quality Expert, Surveyor and Technical Office Manager should have experience on international project in the relevant field of expertise.

Requirements for Operation Service Phase Key Personnel:

Project Manager should have minimum. 10 years of general experience, 5 years of similar experience on construction and/or operation service related to below mentioned subjects;

- wastewater treatment projects with sludge disposal such as sludge drying and or sludge incineration and or sludge digestion and or energy recovery,
- and/or,
- incineration and/or drying projects and /or energy production projects related to waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Project Manager should have experience at least two years in operation of incineration plant/ waste to energy facility or equivalent.

Operation Service Expert should have minimum. 10 years of general experience, 5 years of similar experience on construction and/or operation services related to below mentioned subjects;

- wastewater treatment projects with sludge disposal such as sludge drying and or sludge incineration and or sludge digestion and or energy recovery,
- and/or,
- incineration and/or drying projects and /or energy production projects related to waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Operation Service Expert should have experience at least two years in operation of incineration plant/ waste to energy facility or equivalent.

Mechanical Engineer, Electrical and Electronic Engineer, SCADA Automation Expert, should have experience on construction and/or operation of sludge/waste drying and or sludge/waste incineration and /or energy production and recovery from waste and/or industrial products and/ or energy resources such as coal, natural gas etc.

Environmental and Social Experts, Health and Safety Expert, Cost and Quality Expert and Laboratory Worker should have experience on international project in the relevant field of expertise.

Qualification of the Contractor's Staff shall be complied with the Requirements of the Waste Sludge Incineration and Energy Recovery Facility Project Section IX – Particular Conditions of Contract G.C.C. 1.1.21 & 6.9.

If any key personnel described in GCC 1.1.21 & 6.9 is absent on the construction site during the contract period, after the first written directions with a period of 1 week, a penalty of 50 EUR per person for each day from the beginning of the 8th day shall be applied.

1.6.10. Health and Safety

The Contractor shall carry out all construction in accordance with the laws and regulations of the Republic of Türkiye and the European Union and shall take general safety measures during construction in accordance with Turkish Standards and Occupational Health and Safety Standards. The Contractor shall ensure the safety of the workers on-site, including other third parties and all subcontractors, and shall apply the most appropriate protective measures to the satisfaction of the Employer and the Employer's Representative.

The Contractor shall submit a "Work Safety and Security Plan" to the Employer's Representative within 28 days after the notice of commencement date. The Plan shall set out the Contractor's general view of Occupational Health and Safety in general on the construction site and shall detail the specific measures he intends to take to ensure the safety of his own employees, subcontractors, the public, the Employer's and the Employer's Representative's employees.

The Occupational Safety and Security Plan shall be kept under constant review and amended as necessary during the Contract.

In particular, for the Occupational Safety and Security Plan to be applicable, it must cover the following:

- Safety helmet, boots and protective clothing,
- Support elements, access ladders and working platform,
- Taking safety precautions by covering the working areas with safety barriers or boards,
- Chains, ropes, tow hooks, etc,
- Access to the construction site and lighting,
- First aid units and what to do in emergencies,
- Settlement of the Contractor's employees on site, washing and toilet facilities,
- Fire precautions in construction and construction site buildings.

In addition to the above items, it is the responsibility of the Contractor to provide all requirements for the occupational safety and security of the employees at the construction site.

The Contractor shall appoint a full-time Environmental and Social, Occupational and Labor Safety Specialist, who is certified in this field and has previous field experience in construction works, to ensure safety at the construction site and to take necessary precautions against accidents. This person and/or persons shall have the experience to carry out this task, take measures to prevent accidents and be authorized to issue instructions. During the course of construction, the Contractor shall provide whatever is necessary to enable this person to fulfil his/her responsibilities and exercise his/her authority and shall carry out full-time safety observations and measures on site.

In the event of any accident, the Contractor shall immediately notify the Employer's Representative and submit a report to the Employer's Representative within 24 hours detailing the accident. The Contractor shall keep the report minutes and prepare the accident report requested by the Employer's Representative regarding the health, safety and welfare of the persons.

To be prepared for an emergency;

- First aid equipment (dressings, etc.),
- Person(s) trained to administer first aid,
- Communication and transport plan with the nearest hospital in case of accident emergency,
- Imaging equipment,
- Rescue equipment,
- Fire-fighting equipment, and
- All necessary arrangements shall be made, including the preparation of a communication plan with the nearest fire station.

In addition, in order to ensure the health of workers;

- Drinking water,
- Toilets,
- Washbasins with hot water, soap and towels,
- Dry and warm areas with tables and chairs for eating

and whatever is required for cleaning shall be provided by the Contractor.

Employees under the control of the Contractor, Subcontractors, Employer, Employer's Representative and visitors shall wear "hard hats" on the construction site and shall always wear reflective safety shirts and work shoes that meet work safety requirements.

The work site shall be separated by adequate barriers that are easily visible to vehicles and pedestrians.

Additional lighting shall be provided at night. Warning lights shall be provided for motor vehicles. If the safety measures (lighting-warning signs, etc.) taken by the Contractor are deemed insufficient by the Employer's Representative and the Employer, then the Contractor shall take additional measures deemed necessary in accordance with the instructions of the Employer's Representative (in line with the instructions of UKOME, Traffic Branch Directorate, etc.) at its own expense.

In addition, the Employer has TSE ISO 18001 Occupational Health and Safety Certificate, and the Contractor must comply with the procedures and instructions in field applications. These instructions and procedures shall be taken from the Employer and given to the Contractor by the Employer's Representative at the beginning of the work.

The Employer's Representative is authorized to temporarily stop the works until the completion of the deficiencies or inadequacies in the aforementioned occupational health, emergency plan and protection measures to ensure occupational safety. The Contractor shall not be entitled to claim any time and rights for this reason.

1.6.11. Temporary Facilities for the Employer's Representative Personnel and the Contractors Personnel

The Contractor shall provide a location close to the construction site where the Employer and Employer's Representative shall use until the end of the construction, with lighting and heating, daily cleaning and good working and accommodation conditions. Offices, accommodation and other residential areas shall be established, furnished, equipped and everything shall be completed within 28 days after the notice of commencement date. Approval shall be obtained from the Employer's

Representative for the Office and Accommodation. All necessary equipment, cleaning, water, electricity, internet services etc. related to the Office and Accommodation Area for the Employer's Representative shall be provided by the Contractor without any charge during the contract period.

Equipment required for the placement of the Employer's Representative in the Site Offices:

- The offices shall be built as a single building separate from the Contractor's site office and shall be approximately 300 m2 in size.
- The offices shall be planned to have 6 study rooms (each with an average of 25 m2), a kitchen, toilet, meeting room (25 m2) and an archive room.
- The offices shall be manufactured temporarily and the necessary care should be taken in terms of usage conditions during construction. The office floor should be built at least 20 cm above the ground level to protect against flooding. Plaster paint shall be used on the walls, suspended ceiling panels shall be used on the ceilings, the windows shall be double-glazed and shutters and mosquito nets shall be installed. The floors shall be covered with ceramic/laminate.
- If the construction site toilets are not connected to the sewage system, a leak-proof septic tank must be built and the operating expenses related to this shall be covered by the Contractor.
- There shall be ventilation (cooling/heating) units with a capacity of min. 12,000 Kcal/h in the entrance section, offices and meeting rooms.
- There shall be suitable ventilation fans in the kitchen and toilet.
- The building shall be provided with electricity of appropriate power with a distribution panel.
- All rooms shall have a lighting system in accordance with the standards.
- External lighting shall be provided through the main door.
- All rooms, except the toilet and storage room, shall have at least 4 sockets and a wireless network system.

Furniture required for the Employer's Representative in the Site Offices:

- In each study room, 1 desk with 3 drawers, 1500 x 1000 mm, 1 coffee table, 400 x 400 mm, 1 four-drawer locked file cabinet, a minimum of 2 m2 300 mm deep bookcase with shelves, 1 rotating office chair, 3 additional chairs, 1 clothes hanger.
- In the meeting room: 1 large meeting table measuring 2200 x 1100 mm (with 8 chairs), 1 table measuring 1500 x 1000 mm with three drawers, 1 side table measuring 1000x400 mm, 1 swivel office chair, 2 additional chairs, 1 coffee table measuring 400 x 400 mm.
- In the kitchen: 1 dining table, 6 chairs, 19-liter automatic water machine (hot and cold water), gas or electric water heater, gas or electric stove, refrigerator, sink, counter, cupboards, drinking water, plates, cups, glasses, kitchen utensils and enough dinnerware for 6 people
- Toilet and shower, shower cabin, western toilet, sink and water supply for washing hands, gas or electric water heater and other WC accessories.

1.6.11.1. Equipment

1 unit A3/A4 scanning-capable color photocopy machine (with either a touchscreen or keypad control panel display, paper capacity of approximately 1,200 sheets, Copy Resolution: up to 600 x 600 dpi, Print Resolution: up to 1200 x 2400 dpi, equipped with Bluetooth / Ethernet and USB 2.0

connectivity), and 8 laptops (min. i7, 32 GB DDR, 1TB SDD, 2 GB GRAPHIC CARD) with software required licenses, internet connection (ADSL and wireless). All these equipment must have the licenses of the software to be used for the work and the maintenance agreements must be made by the Contractor.

Besides, as a contractual requirement, the following shall be provided by the Contractor to the Employer's Representative;

- Broadband internet subscription.
- Mobile phones with SIM cards and local usage contracts shall be provided for the technical personnel of the Employer's Representative working full-time at the construction site.
- The mobile phones to be provided shall support internet connectivity and be capable of image and video transmission.
- Each mobile phone shall be manufactured in 2024 or later and shall have a minimum internal storage capacity of 256 GB, a rear camera with at least 48 MP resolution, and a current mobile operating system (iOS or equivalent).
- For the meeting room, 1 min. 75" Full HD Smart Led TV
- For the Employer's Representative's office, 1 min. 65" Full HD Smart Led TV.

Protective clothing for the use of the Employer's Representative's staff shall be provided as follows;

- 8 pairs of safety work shoes.
- 8 reflective safety jackets (lightweight).
- 8 hard hats, raincoats and rain boots.

All consumables (ink, toner, A3/A4 size paper, maintenance services, etc.) of the printer and photocopier devices shall be used only for the works within the framework of the contract and shall be provided by the Contractor without any charge during the Contract period.

All expenses such as cleaning, water, electricity, etc., as well as 1 personnel to work full time in the construction site for Employer's Representative's office for cleaning services shall be provided by the Contractor.

All telephones, mobile phones shall be used only for the works within the framework of the contract, internet subscriptions and payments for invoices shall be paid by the Contractor within the scope of the contract following the control and confirmation of the Employer's Representative.

Equipment to be Provided to the Employer and Employer's Representative

The Contractor shall provide the following equipment for the Employer's Representative and his staff to use in the field:

- 1 automatic level indicator and tripod (Levelling Instrument) with telescopic legs.
- 1 telescopic round bubble metal levelling element (Levelling Rod).
- 3 pieces of 30 meter steel meters.

The Contractor shall be responsible for the maintenance and calibration of the equipment and shall replace the equipment immediately if any fault is found in the equipment.

The Contractor shall have personnel with appropriate qualifications so that the Employer's Representative and his staff can easily carry out the controls and measurements.

The Contractor shall photocopy and deliver all standards and specifications requested by the Employer's Representative and these copies shall be prepared at the construction site before the start of construction.

1.6.11.2. Vehicles

The Contractor shall provide the Employer's Representative with 2025 model or higher model "C" segment vehicles with the features specified below, without interruption through the contract period, upon the request of the Employer and the Employer's Representative. In the event that any of the vehicles fail to provide service, it shall provide a vehicle with the same features within 24 hours at the latest.

During this period, all kinds of maintenance, insurance, car insurance, fuel, etc. operating expenses shall be covered by the Contractor and paid from the relevant item. In the event that the Contractor rents vehicles from outside or provides its own vehicles within the scope of the contract, all kinds of material and physical compensation and expenses arising from damages caused to third parties shall be covered by the compulsory traffic insurance and car insurance made by the Contractor, and damages to be incurred against third parties shall be within the guarantees and guarantee limits of the compulsory traffic insurance and car insurance.

The vehicles shall be used during the Contract Period (including Operation Service) within the scope of the contract and shall be returned to the Contractor after the Contract Completion Certificate is issued.

Table 5: Vehicle Features

	Vehicle Features
Fuel	Gasoline/Hybrid/Electric
Maximum Power (CE)	min. 110 HP
Transmission	Automatic
Brake System	ABS
Safety	min. 2 Airbags
Door Quantity	min. 4 doors
Comfort	With air conditioner
Traction System	4x2
Segment	C