# Republic of Iraq
# Ministry of Electricity
# General Directorate For Gas
# Power Plant Projects

# NAINAWA 6 X125 MW 9E
# Gas Turbines Power Plant Projects

## Section VI, Chapter 6, Annex 01
## C.O Treatment Plant

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**"Based on the Site information received from MOE, this conceptual design document is provided to the EPC Contractor for developing his proposal for this project. Preparation of the Site specific Power Plant detailed Design is the sole responsibility of the EPC Contractor"**

# IRAQ PROJECTS - 6 Gas Turbine

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# LIQUID FUEL OIL SYSTEMS

&

# CONCEPTUAL DESIGN FOR TREATMENT AND STORAGE

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## ETAT DES MODIFICATIONS

| INDEX | DATE | DESCRIPTION |
|---|---|---|
| A | 16 June 2010 | First issue |
| B | 22 June 2010 | Up dated of the specification issue GEI41047 |

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## 1. PURPOSE OF THE DOCUMENT

This specification describes essential data required for the design of Liquid Fuel Systems to be implemented on Iraqi projects with GE 9E gas turbine units.

This functional description is applicable on the power plant with six (6) Gas Turbine

**Caution:**

This specification is intended for the design of the FOTP only and does not define the HFO quality that can be burned in GTs which is the matter of distinct specification.

Glossary :

- Gas Turbine (GT)
- Fuel Oil Treatment Plant (FOTP)
- Effluent Water Treatment Plant (EWTP)
- Heavy Fuel Oil (HFO)
- Light Distillate Oil (LDO)

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## 2. HFO ESSENTIAL DATA FOR BASIC DESIGN

- The GT consumption : each 9E unit has a consumption of 32 000 kg/h of treated HFO at base load at –5°C, with a derating corresponding to an hypothesis of 63 ppm of Vanadium content with water injection for NOx reduction. **six GT** represent a total of **192 000 kg/h.**
- Viscosity curve : ***appendix 1*** Allows to define the HFO temperature to match the adequate viscosity
- Typical HFO analysis : The following HFO analysis data have to be considered to design the different equipment. The specification *GEI 41047 revision M* will be considered as Basic Design Document.

| **Characteristic** | **Design for FOTP only** |
|---|---|
| -Kinematic viscosity at 50°C | Up to 380 cSt max (1) |
| - Pour point °C | < 25°C |
| - Sediment % | < 0.5% |
| - Flash point °C | > 65°C (for Heavy) |
| - Water content % | < 1.5% |
| - Calorific value | Not relevant for FOTP |
| - Specific gravity at 15°C | 0.985 max |
| - Ash % | <0,02 % |
| - sulfur % | Not relevant for FOTP |
| - Wax content % | < 0,4% |
| - Hydrogen % | Not relevant for FOTP |
| - Carbon conradson % wt | Not relevant for FOTP |
| - Asphaltenes % | 5 % See *GEI 41047* |
| **- contaminants (content in ppm) :** | |
| * vanadium | Not relevant for FOTP |
| * Sodium<br>* Potassium | Na +K < 100 ppm |
| * lead | Not relevant for FOTP |
| * Calcium | < 10 ppm<br>as per *GEI 41047* |
| * Magnesium | Not specified for FOTP |
| * Nickel | Not relevant for FOTP |
| * Zinc | Not relevant for FOTP |

(1) High value of viscosity up to 380 cSt @ 50°C can be reached occasionally and shall not reduce treatment capacity.

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## 3. FOTP AND HFO STORAGE CONCEPTUAL DESIGN:

Please refer to the attached process flow diagram n° 223D6952 which has been developed for this case. In addition the following GE specifications are applicable:

-GEK 28153 A Recommendations for handling and treating liquid fuels
-GEK 28163 A Recommendations for storage of liquid fuels
-GER 3481 C Liquid Fuel Treatment Systems
-GEI 41047 M Gas Turbine Liquid Fuel Specifications

In addition specific PID's have been developed for better clarity of each HFO & LDO storage & distribution, Hot water distribution, Demin water distribution , Compressed air distribution. See below.

### 3.1. FOTP nominal flow calculation:

Each 9E unit has a HFO consumption of 32t/h, i.e. **192t/h** (max flow at -5°C ambient temperature) for a site with **6GTs**.

This FOTP production equal the GT power plant consumption at full load with an air ambient temperature of -5°C.

Each GT must be stopped during approximately 18 hours per week for an OFF LINE washing to restore the GT Performance. But this shut down period shall not be taken in consideration to calculate the FOTP nominal flow.

The supplier of FOTP shall foresee the required number of treatment lines to obtain a nominal flow of 192t/h. A spare capacity of 20% needs to be provided and should be equivalent at least to one line in stand-by. All the treatment lines can be in operation together. The capacity of the separator shall be defined by the supplier for the HFO analysis as indicated in Chapter 2. The design of the FOTP shall be suitable for a continuous operation. ( 24h/24h- 7d/7d) .

### 3.2. FOTP treatment capability:

Each line of treatment includes two stages, each one with separators and mixers able to reduce NA+K from 100ppm max to less than < 1 ppm Na + K.

To avoid pollution, contamination from any source, it is forbidden to return any fuel leakage or drainage effluent to the Raw HFO tank.

### 3.3. FOTP scope of work:

The FOTP scope of supply includes :

- All the separators, mixers, heaters, pumps delivered on skids mounted , with on base equipment fully complete as well as an electrical control and instrumentation cubicle.
- FOTP Effluent Water Treatment skids. Effluent water will not exceed 10ppm of oil before discharge to sewage.

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- Interconnection material (cables, cable trays , piping, pipe rack, electrical heat tracing, etc) delivered as loose items.
- Laboratories equipment : such as Densimeter, viscosity-meter, spectrometer to be installed in a dedicated building.

### 3.4. FOTP Interfaces connections:

**Interface point n° 1 RAW HFO Inlet, see simplified PID appendix 3 and PID n° 223D6952**
Coming from storage tanks, after 24hours of settlement minimum.
HFO in accordance with the specification.
NPSHR: 7,5 m
Minimum Level of the fuel oil in tanks higher than the level of the pumps axe.
Maximal pressure: 1,5 bar ( g ).
Temperature fuel oil: minimum 40°C to obtain a maximal viscosity < 800 cSt
Maximum: 60°C
Flow: from 0 t/h to max available FOTP capacity (depending on the number of lines in operation)

**Interface point n°2 RAW HFO return, see simplified PID appendix 3 and PID n° 223D6952**
Coming from the FOTP and return to Raw HFO tanks during the starting phases and recirculation of the FOTP
Flow: from 0 t/h to max available FOTP capacity (depending on the number of lines in operation)
Maximal counter pressure authorized 2 barg including the tank height
Maximal Temperature : 20°C above the inlet temperature, **Interface n°1.**

**Interface point n°3 Treated HFO outlet, see simplified PID appendix 3 and PID n° 223D6952**
Coming from the FOTP to certification tank.
Na + K < 1 ppm.
Flow: from 0 t/h to max available FOTP capacity (depending on the number of lines in operation)
Maximal counter pressure authorized 2 barg including the tank height
Maximal Temperature : 20°C above the inlet temperature, **Interface n°1.**

**Interface point n°4 – Compressed air, see simplified PID appendix 3 and PID n° 223D6953**
Coming from the Air Processing Unit of the power plant.
Dry and free of oil.
Pressure: 6 to 10 barg.
Normal consumption : 10 $Nm^3/h$,
Peak consumption : 30 $Nm^3/h$

**Interface point n°5 – Demineralized water, see simplified PID appendix 3 and PID n°223D6955**
Coming from a demineralized water tank.
Inlet pressure : 6 to 8 bar(g)
Temperature : ambient.
Maximal flow: = 10% of the maximal HFO flow
Maximal instantaneous flow ( discharge cycle) : 10% of the maximal HFO flow
Water quality :

| | |
|---|---|
| hardness: | max. 10°dH (German hardness) = 180 mg/$dm^3$ $CaCO_3$ |
| PH value : | 6,5 - 7,5 |
| Chloride ions : | max. 100 mg/l |
| Na + K : | max. 40 ppm |
| Particle size: | max. 50 micron. |

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**Interface point n°6 –heating means Inlet see simplified PID appendix 3 and PID n° 223D6954**
**Interface point n°7 –heating means Outlet**
Coming from the auxiliary boilers.
The characteristics of the hot water or steam have an impact on the exchangers design, typically on the inlet and outlet temperatures, the nominal pressure, the maximal acceptable pressure drop, etc.
The parallel treatment lines of the FOTP are started successively, and not simultaneously. The maximal heat consumption will be met when the nominal number of lines being are in operation and the stand by lines are starting.
The auxiliary boilers regulation shall take into account the variation of water or steam flow and temperature of the FOTP, depending on the number of treatment lines in operation.

**Interface point n°8 – Demulsifier.**
Delivered in standard trunks of 55 gallons (~ 208 l). This Product will be selected by the FOTP supplier. A portable pump included in the FOTP scope allows to transfer the demulsifier from the trunk to a storage tank, sized for 3 days of FOTP operation.
Consumption: will be determined after field tests. Expected consumption around 250ppm.

**Interface point n°9 – Emulsion breaker if required**
Delivered in standard trunks of 55 gallons (~ 208 l). Product will be selected by the EWTP supplier.
Portable pump included in the EWTP scope allows to transfer the product from the trunk to a storage tank sized for to 3 days of FOTP operation.
Consumption: will be determined after field tests. Could be of the order of 5 l/h.

**Interface point n°10 – Clean water.**
Maximal flow: = 10% of the maximal HFO flow
Water Temperature 15 to 20°C above **Interface n°5.**
This water contains some chlorides such as Na & K with less than 10ppm of free oil in the water
Maximal counter pressure authorized : 2barg
This water can be send directly to the river. The contaminant content is compliant to the local environmental regulation.

**Interface point n°11 – Sludge .**
Contains mainly the heaviest elements and the various residues extracted from the HFO, with a low percentage of water.
The main flow come from the discharge phase of separators and also the drains, the leakages and the residues of samplings of FOTP.
It is forbidden to recycle this product in the FOTP via the Raw HFO tank.
Estimated quantity: approximately 5% of the FOTP flow.
Pressure: approximately 3 bar ( g ). Directly connected to the oily water separator of the site.

**Interface point n°12 – Potable Water.**
For water supply to the of laboratory bench as part of the " fuel oil laboratory analyzes ".
To supply the showers / and eyes shower safety features included in the scope of the FOTP supplier.
Pressure, temperature, flow and quality as for standard "domestic" use.

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**Interface point n°13 – Electrical power.**
400 VAC TRI - 50 Hz –
Estimated Installed power : ~ 7% of the nominal flow ( 64t/h) (7% of 64t/h)x100 = 448kW

**Interface point n°14 – Control Instrumentation.**
Remote data connection from PLC to Central Control Room for Display only.
Start up and operation have to be done locally with sufficient and permanent staff, taking care of rotating machines ready to start and operating correctly.

## 4. HFO STORAGE SIZING.

The tank filling flows, the capacities, the discharge rates, the sequencing of all the tanks shall allow a settlement of the content before use of 24 hours, according to the specification *GEK 28163* (except for the certification tanks). All the tanks inlets and outlets shall be equipped with automatic gate valves controlled by a dedicated centralized PLC (GE Fanuc).

Every tank must be equipped with sampling point and shall be in accordance with *API650* or equivalent.

- **Raw HFO unloading station**

It shall be designed to allow as many trucks as necessary to match the total unloading flow of the Raw HFO tanks. As the HFO tank is maintained to a temperature between 40 to 60°C, HFO must be heated upstream unloading station (inside truck). Minimum total unloading flow for HFO is as per table below.

- **Raw HFO storage tank (refer to PID n° 223D6961)**

Two (2) storage tanks for Raw HFO. Detail of each tank (size in accordance with API650)

| Each tank | Calculated Net volume | Diameter | height | Gross volume | Temperature mini/design/max | Mini unloading flow |
|---|---|---|---|---|---|---|
| 6 GT | 11567 m3 | 36.58 m | 12.8 m | 13450 m3 | 40°C/50°C/60°C | 348m3/h |

Design requirements :

- The net volume of the two (2) tanks correspond to **5 days** of GT power plant consumption. The filling flow of the tank ( from unloading station) shall be designed for a continuous operation of the FOTP including the 24 hours settling time before use.
- The heating system shall be designed to maintain the fuel at the above design temperature at the site minimum ambient temperature (refer to above table for Min/Design/Max temperatures).
- Hypothesis for storage volume calculation: an average specific gravity 0,95.

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- **Certification HFO storage tank (refer to PID n° 223D6959)**

  GE recommends two ( 2 ) tanks of certification (one in filling, the other one in control and transfer to the storage of treated HFO. These tanks shall have a net storage capacity (see below table) corresponding to an operation of approximately 8 hours of the FOTP.

| Each tank | Calculated Net volume | Diameter | height | Gross volum | Temperature mini/design/max | Mini transfer flow |
|---|---|---|---|---|---|---|
| 6GT | 1617 m3 | 18.29 m | 12.8 m | 3362 m3 | 50°C/60°C/80°C | 538m3/h |

  Design requirements :

  - The heating system shall be designed to maintain the fuel at the above design temperature at the site minimum ambient temperature (refer to above table for Min/Design/Max temperatures).
  - Minimize the dead volume
  - The suction at transfer point shall be by the drain system (avoid floating suction).
  - The inlet shall be designed to create turbulences and a mixing effect, in order to have a sampling for analysis as representative as possible of the tank content.
  - To maintain a stable counter pressure at the FOTP outlet , this inlet shall be located at the top of the tank to maintain a stable counter pressure at the outlet.

- **Transfer HFO skid from certification tanks** (Refer to flow diagram n° 223D6952)

  The HFO transfer pumping skid 2 x 100 % allows to transfer the HFO from the certification tank either :

  - back to the raw HFO tank if the fuel analysis is uncorrect ( Na+K> 1ppm)
  - or to the treated HFO tank if the fuel analysis is correct (Na+K< 1ppm)

  Design requirements :

  - The filling duration is 8 hours, then 3 hours for sampling and control and 5 hours for transfer. Therefore, the required design flow is **538** m3/h.
  - The Total Discharge Head (TDH) of the pump will be a function of the pipe network and the tank height.



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- **Treated HFO storage tank See PID n° 223D6481**

  To be able to ensure the 24 hours settlement of the fuel oil before use (according to the specification GEK 28163), three ( 3 ) tanks of treated HFO are necessary.

| Each tank | Calculated Net volume | Diameter | height | Temperature mini/design/max | Gross volume |
|---|---|---|---|---|---|
| 6 GT | 5081m3 | 24.38 m | 12.8 m | 50°C/60°C/70°C | 5978 m3 |

Design requirements :

- One tank in filling, one tank in settlement and one tank is supplying to the GT.
- The heating system shall be designed to maintain the fuel at the above design temperature at the site minimum ambient temperature (refer to above table for Min/Design/Max temperatures).

## 5. LDO ESSENTIAL DATA FOR BASIC DESIGN

- GT consumption : each 9E unit has a consumption of 19200 kg/h of treated LDO at base load at – 5°C. Ten GT represent a total of 192000 kg/h. It shall be considered that the LDO will also feed the emergency diesel engine and the fire fighting motor pump
- Viscosity curve : ***appendix 2*** Allows to define the LDO temperature to match the adequate viscosity. The expectation of a viscosity between 1,8cSt and 10cSt requires to maintain the LDO temperature inside the tank above 20°C.

No heating inside LDO tank considering the required viscosity

- Typical LDO analysis : The following LDO analysis d to design the different equipment. The specification *GEI 41047* will be cons Document.
- An average specific gravity of the LDO is taken at 0.
- The GT will operate with LDO during start up and shutdown sequence or exceptionally few hours when a HFO failure occurs.
- The flash point of the LDO > 54°C requires an ATEX study to be performed by the EPC.

| | To be used for Design |
|---|---|
| - Viscosity to 40°C | 5,6 cSt |
| - Sulfur content | 0,3% wt max |
| - Flash point °C | > 54°C |
| Specific gravity at 15°C | 0.85 |
| - Water and sediment | < 0,5% wt |
| - ash | Nil |
| - Pour point °C | -9°C |
| - contaminants (en ppm) | |
| * vanadium | 0,5 max |
| * Sodium + Potassium | 1 max |
| * lead | 1 max |
| * Calcium | 2 max |
| * Magnesium | 0,4 max |
| * Calorific value | > 42000 KJ/Kg |

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## 6. LDO STORAGE CONCEPTUAL DESIGN

Refer simplified PID Appendix 4 and PID n° 223D6953 and 223D6952

### 6.1. LDO nominal flow calculation

Each 9E unit has a LDO consumption of 32t/h, i.e. **192t/h** for a site equipped with **6 GTs**.

This maximum consumption is calculated at full load with an air ambient temperature of -5°C.

### 6.2. LDO Equipment Sizing.

The tank filling flows, the capacities, the discharge rates, the sequencing of all the tanks shall allow a settlement of the content before use of 24 hours, according to the specification *GEK 28163* (except for the certification tanks). All the tanks inlets and outlets shall be equipped with automatic gate valves controlled by a dedicated centralized PLC (GE Fanuc).

Every tank must be equipped with sampling point and shall be in accordance with *API650* or equivalent.

- **LDO unloading station**

  It shall be designed to allow as many trucks as necessary to match the total unloading flow of the LDO tanks. LDO tank is maintained to a temperature to 20°C. Minimum total unloading flow for LDO is as per table below.

- **LDO storage tank (refer to PID n° 223D6958)**

  Two (2) storage tanks for Raw LDO. Detail of each tank (size in accordance with API650).

| Each tank | Calculated Net volume | Diameter | height | Gross volum | Mini Unloading flow |
|---|---|---|---|---|---|
| Nb of GT 6 | 8220 m3 | 30.48 m | 12.8 m | 9340 m3 | 170m3/h |

Design requirements :

The net volume of the two (2) tanks correspond to **3 days** of GT power plant consumption. The filling flow of the tank ( from unloading station) shall be designed for a continuous operation of the GTs.

5 days storage

volume and sizes to be corrected for 5 days storage



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## 7. LDO AND HFO INTERFACES FOR GAS TURBINE

**Interface point n°20 –LDO inlet Gas Turbine forwarding skid. See appendix 4**
LDO in accordance with the specification. The NPSHR is 8 m. The minimum Level of the fuel oil in tanks shall be higher than the level of the pumps axe.
The LDO viscosity shall be sent to this interface between 1,8cSt and 10cSt at any site ambient temperature (see the viscosity curve attached).
At the maximum air site temperature, LDO viscosity must be > 1.8cSt, see the viscosity curve attached
Maximal pressure : 3 bar(g).
Maximal LDO flow = Maximal GT flow

correct to minimum

**Interface point n°21 – HFO inlet Gas Turbine forwarding skid.**
Coming from storage tanks, after a minimum of 24hours of settlement. HFO shall be in accordance with the specification. Na+K< 1ppm.
The NPSHR is 8 m. The minimum Level of the fuel oil in tanks higher than the level of the pumps axe.
Temperature : Minimum 50°C to obtain a maximal viscosity < 400 cSt and maximum: 60°C.
Maximal pressure: 3 barg.
Maximal flow = GT maximal flow with a return flow during transition phase (3 t/h)

## 8. REFERENCE DOCUMENT

### 8.1. GE Specification

GEI 41047 M - Gas turbine liquid fuel specification

GEK 28153 A - Recommendations for handling and treating liquid fuels

GEK 28163 A - Recommendations for storage of liquid fuels

GER 3481 C - Liquid fuel Treatment systems

### 8.2. GE Process & Instrument Diagram

General fuel Distribution n° 223D6952

Compressed air distribution n° 223D6953

Hot water distribution n° 223D6954

Demineralised water distribution n° 223D6955

LDO storage tank n° 223D6958

Raw HFO storage tank n° 223D6961

Treated HFO storage tank n° 223D6960

Certification HFO storage tank n° 223D6959



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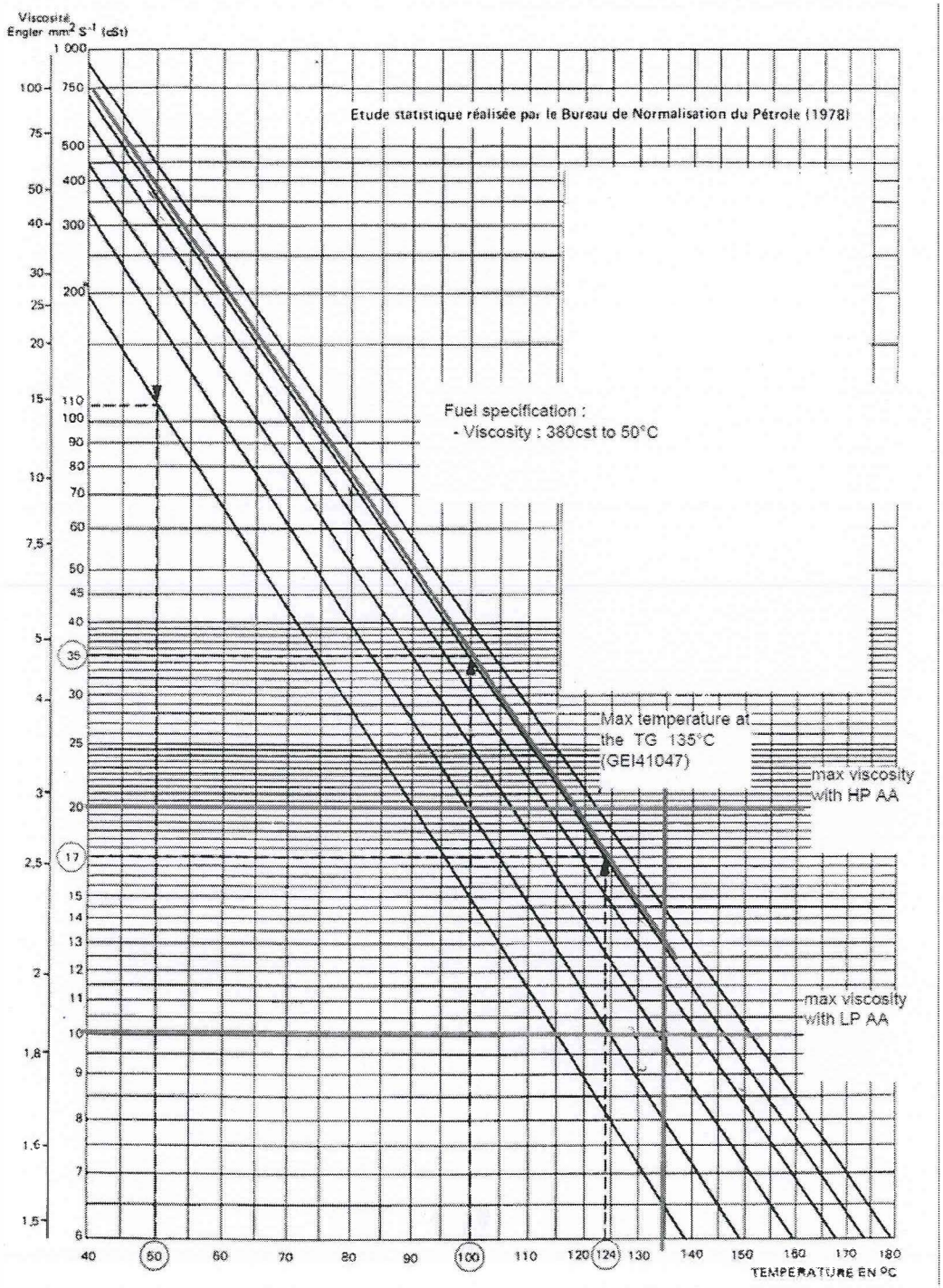
## APPENDIX 1 - HFO Viscosity Curve



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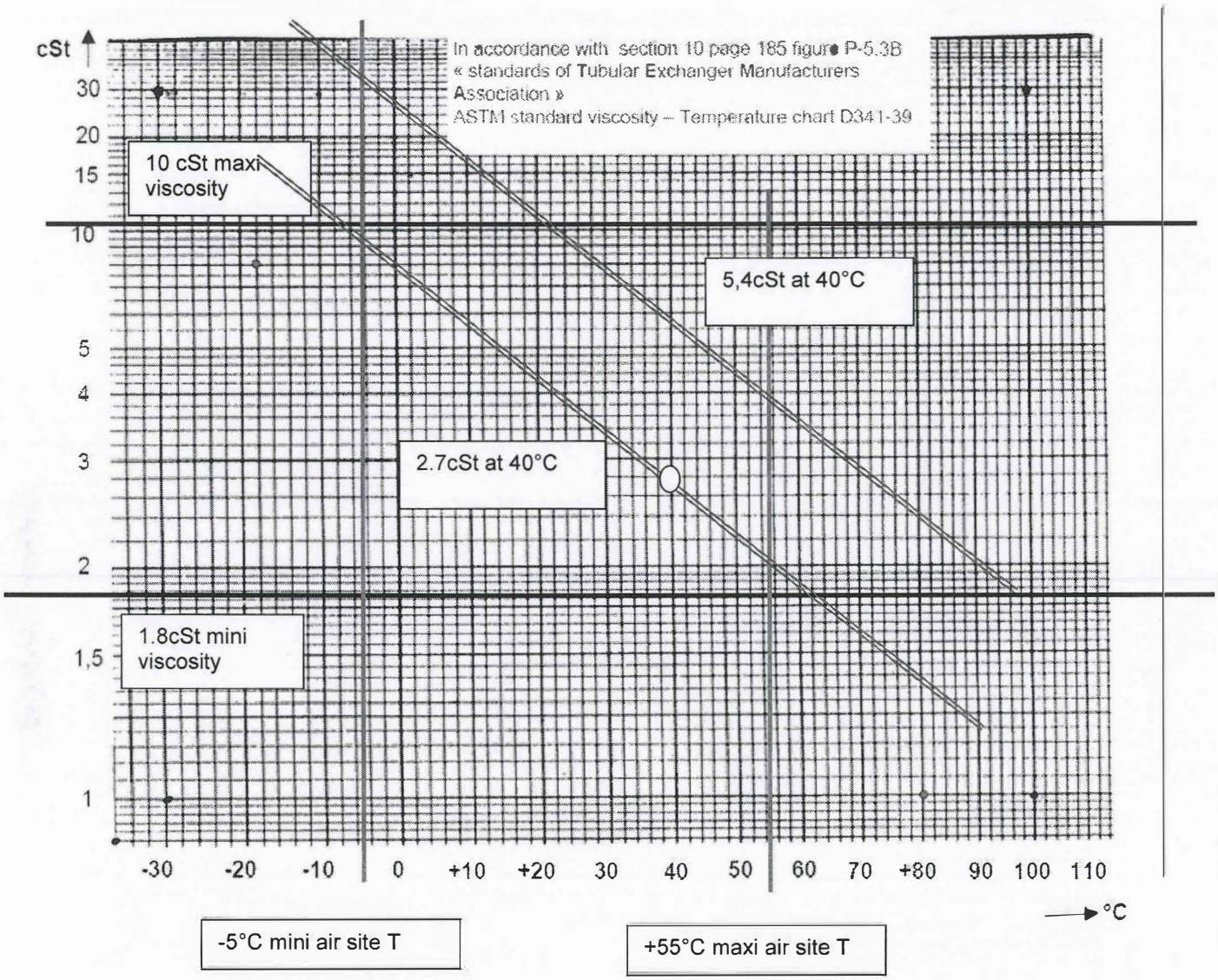
## APPENDIX 2 - LDO Viscosity Curve



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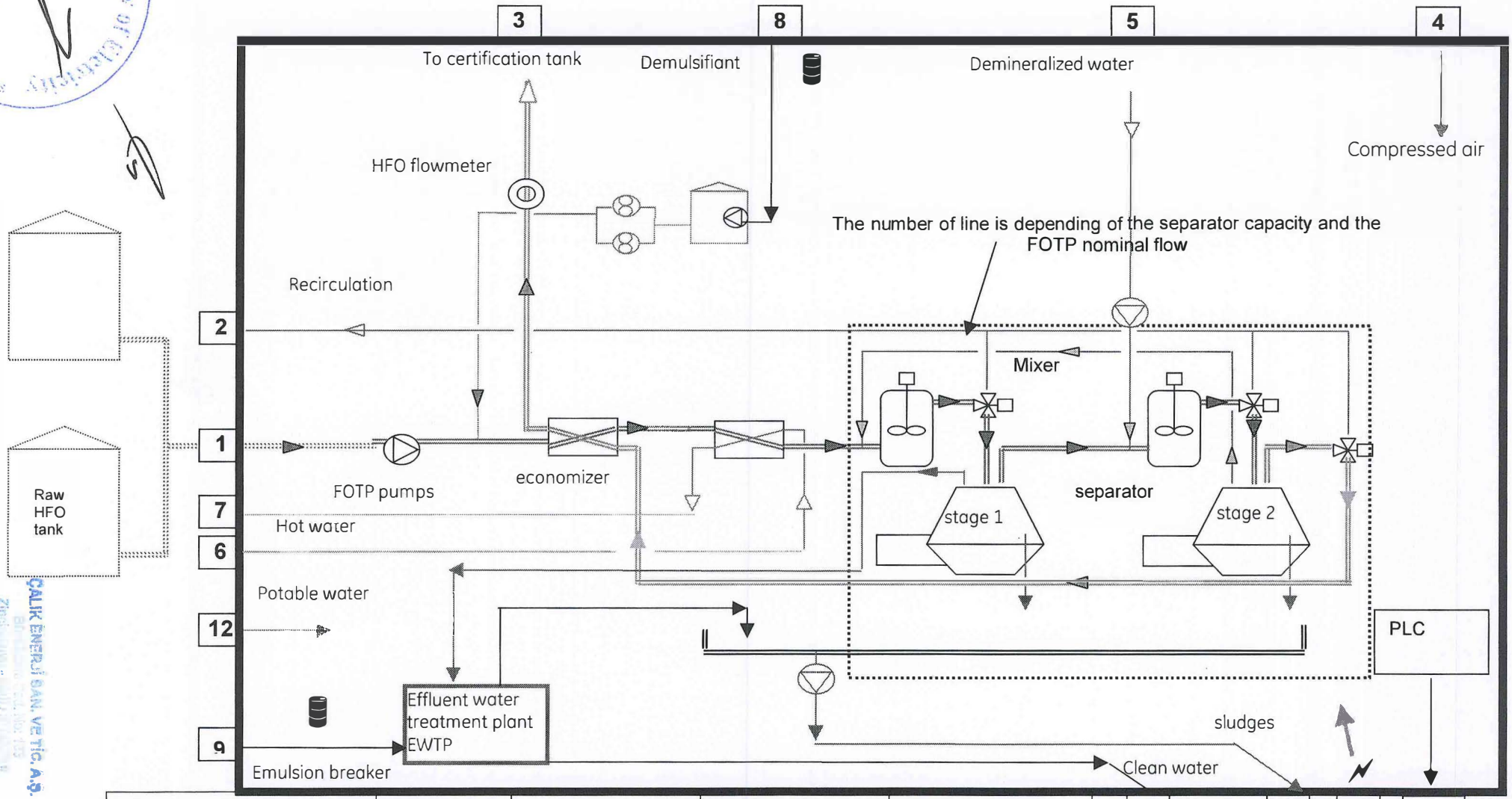
Büyükdere Cad. No: 193
Zincirlikuyu - Şişli / İSTANBUL
Türkiye Mükellefler V.D. 872 005 3993

| GE Energy | IRAQ –LIQUID FUEL OIL SYSTEMS<br>Conceptual Design for Treatment & Storage |
|---|---|

**APPENDIX 3 – FOTP Process Diagram**







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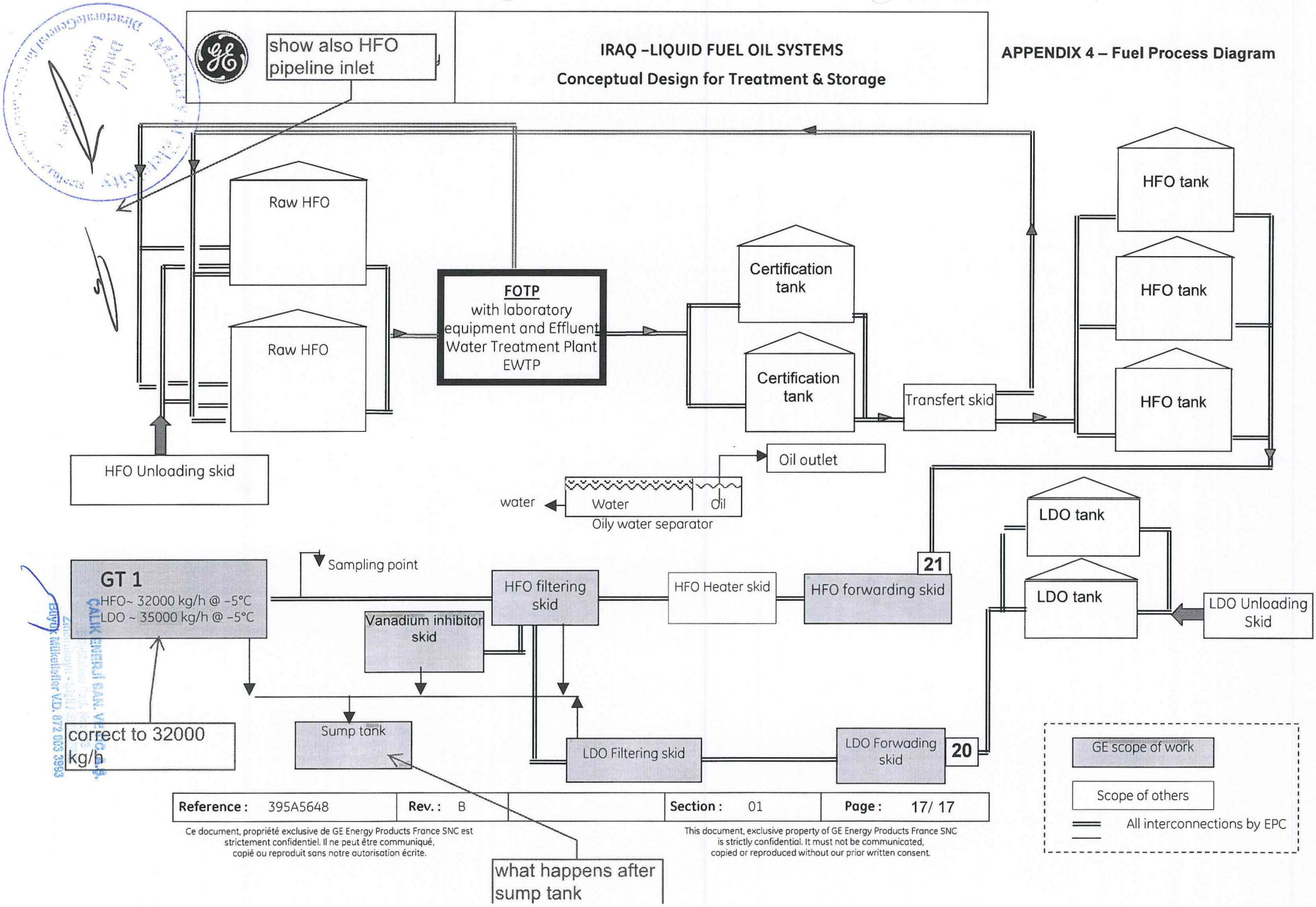
show also HFO pipeline inlet
IRAQ –LIQUID FUEL OIL SYSTEMS
Conceptual Design for Treatment & Storage
APPENDIX 4 – Fuel Process Diagram
Raw HFO
Raw HFO
FOTP
with laboratory equipment and Effluent Water Treatment Plant EWTP
Certification tank
Certification tank
Transfert skid
HFO tank
HFO tank
HFO tank
HFO Unloading skid
Oil outlet
water
Water
Oil
Oily water separator
LDO tank
LDO tank
LDO Unloading Skid
GT 1
HFO~ 32000 kg/h @ -5°C
LDO ~ 35000 kg/h @ -5°C
Sampling point
HFO filtering skid
HFO Heater skid
HFO forwarding skid
21
Vanadium inhibitor skid
correct to 32000 kg/h
Sump tank
LDO Filtering skid
LDO Forwading skid
20
what happens after sump tank
GE scope of work
Scope of others
All interconnections by EPC
Reference : 395A5648
Rev. : B
Section : 01
Page : 17/ 17
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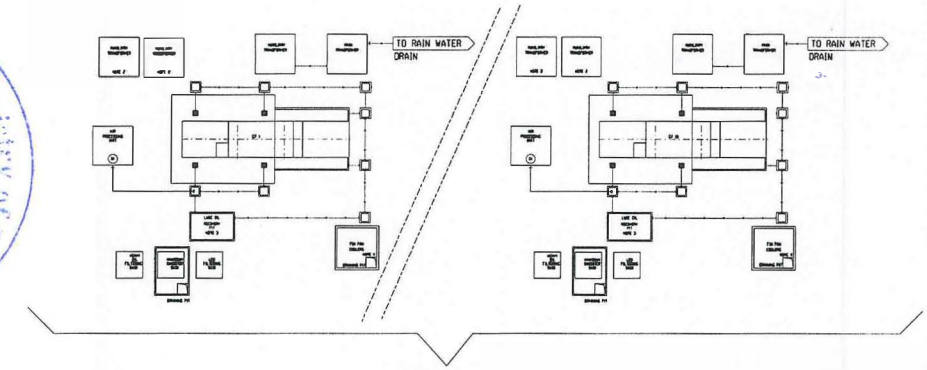



NOTE 1 THE EQUIPMENTS CONTAINING HYDROCARBONS WILL BE SURROUNDED BY A CONCRETE CURBE. DRAINING OF THE CONTAINMENT BY PORTABLE PUMP. (BY OTHERS)

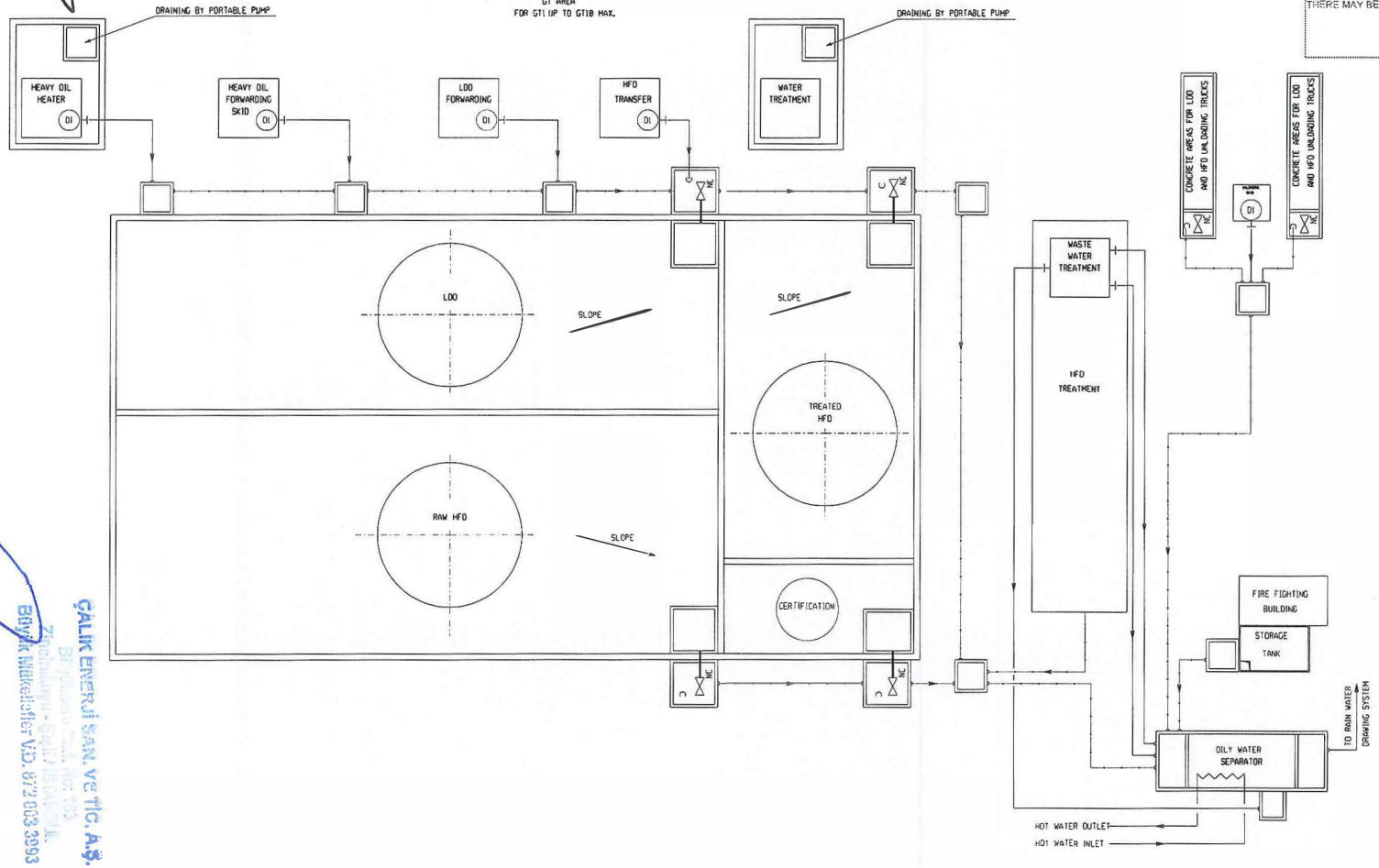
NOTE 2 TRANSFORMER AERA EQUIPED WITH OIL CONTAINMENT

NOTE 3 CONCERTE OIL RECOVERY PIT. DRAINING BY TRUCK. (BY OTHERS)

NOTE 4 FIN FAN COOLERS AND CIRCULATING PUMPS WILL BE SURROUNDED BY A CONCRETE CURBE. DRAINING OF THE CONTAINMENT BY PORTABLE PUMP. (BY OTHERS)

NOTE 5 PIPING CHANNELS WILL BE SLOPED. DRAINING AT LOW POINT BY PORTABLE PUMP. (BY OTHERS)

NOTE 6 NUMBER OF THE OIL SEPERATORS ARE DEFINED AFTER DETAIL DESIGN, THERE MAY BE MORE THAN ONE OIL WATER SEPERATOR.




CONCRETE PIPE

STEEL PIPE

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MINISTRY OF ELECTRICITY
- IRAQ -

MEGA DEAL POWER PLANT

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| FORMAT/SIZE A1 | VISA | | | |
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TITRE/TITLE
RESEAU DRAINAGE EAUX HUILEUSES
OILY WATER NETWORKS

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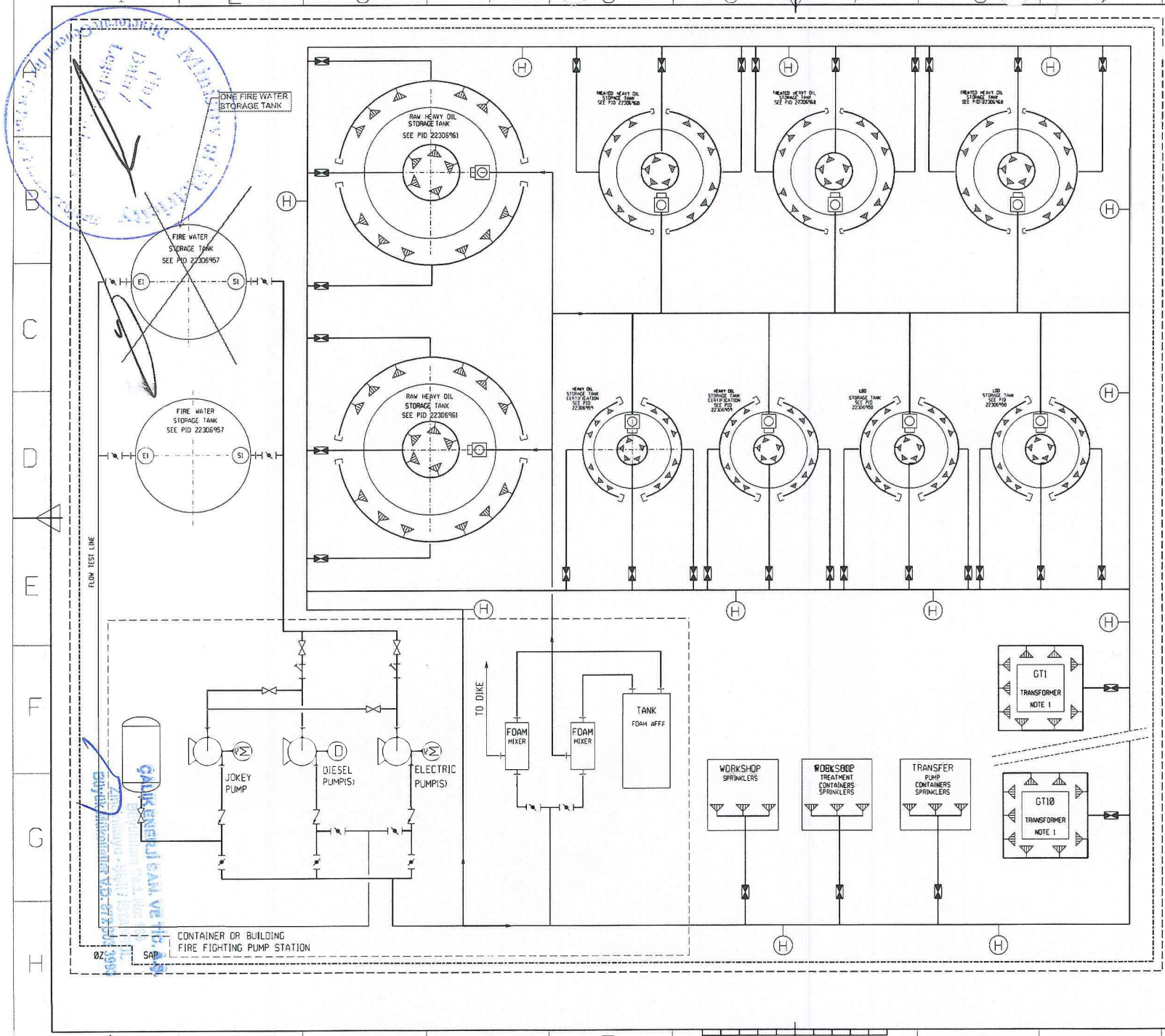


GENERAL NOTE:
MAIN FIRE FIGHTING PANEL SHALL BE IN SUPERVISED ROOM DETECTION AND EXTINGUISHERS IN ELECTRICAL ROOM (NO WATER PROTECTION) APPROPRIATE DETECTION AND EXTINGUISHERS IN THE OTHER BUILDINGS.

HOSE REEL SHALL BE INSTALLED AT EACH ENTRANCE IN CORRIDOR OF ADMINISTRATIVE BUILDING WORKSHOP AND CENTRAL CONTROL BUILDING. AT EACH LEVEL DISTANCE BETWEEN EACH HOSE REEL NO MORE THAN 30 METERS.

HYDRANT MAIN LOOP SHALL BE ROUTED ARROUND THE POWER PLANT WITH ISOLATING VALVES. DISTANCE BEETWEEN EACH HYDRANT NO MORE 80 METERS. DURING MAINTENANCE 50% OF AREA MUST BE PROTECTED, NO MORE 3 OR 4 HYDRANTS SHALL BE ISOLATED.

TO AVOID FROOZEN OUTDOOR PIPING UNDER WATER SHALL BE ISOLATED ABOVE THE FLOOR

NOTE 1: FOR GT1 UP TO GT10 MAX.

NUMBER OF TRANSFORMERS ARE DEFINED AFTER DETAIL ENGINEERING PHASE
NUMBER AND CONNECTION SEQUENCE OF YARD HYDRANTS ARE DEFINED AFTER DETAIL DESIGN

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PROTECTION INCENDIE SITE
SITE FIRE FIGHTING P&ID

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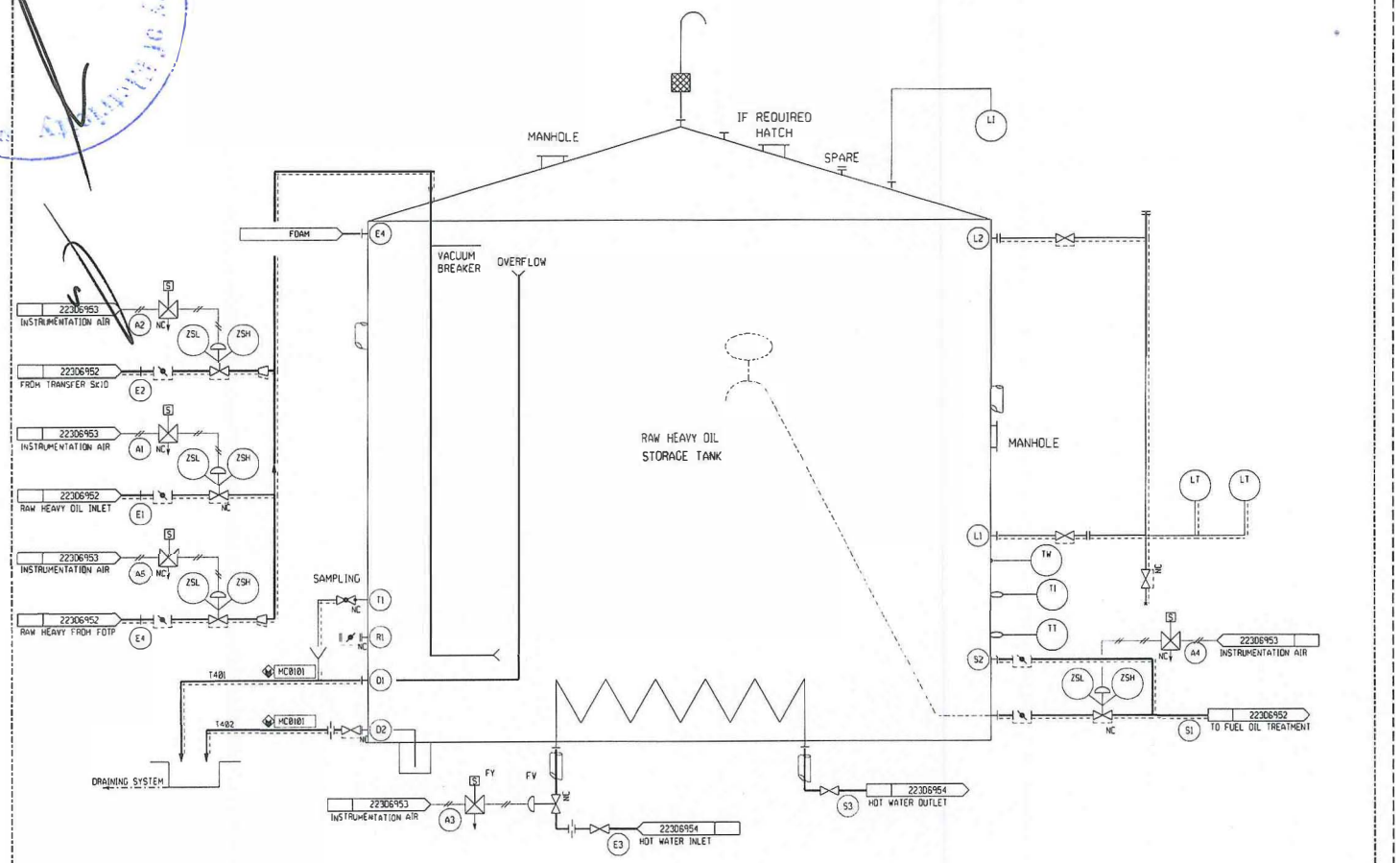


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RESERVOIR DE STOCKAGE BRUT LOURD
RAW HEAVY OIL STORAGE TANK

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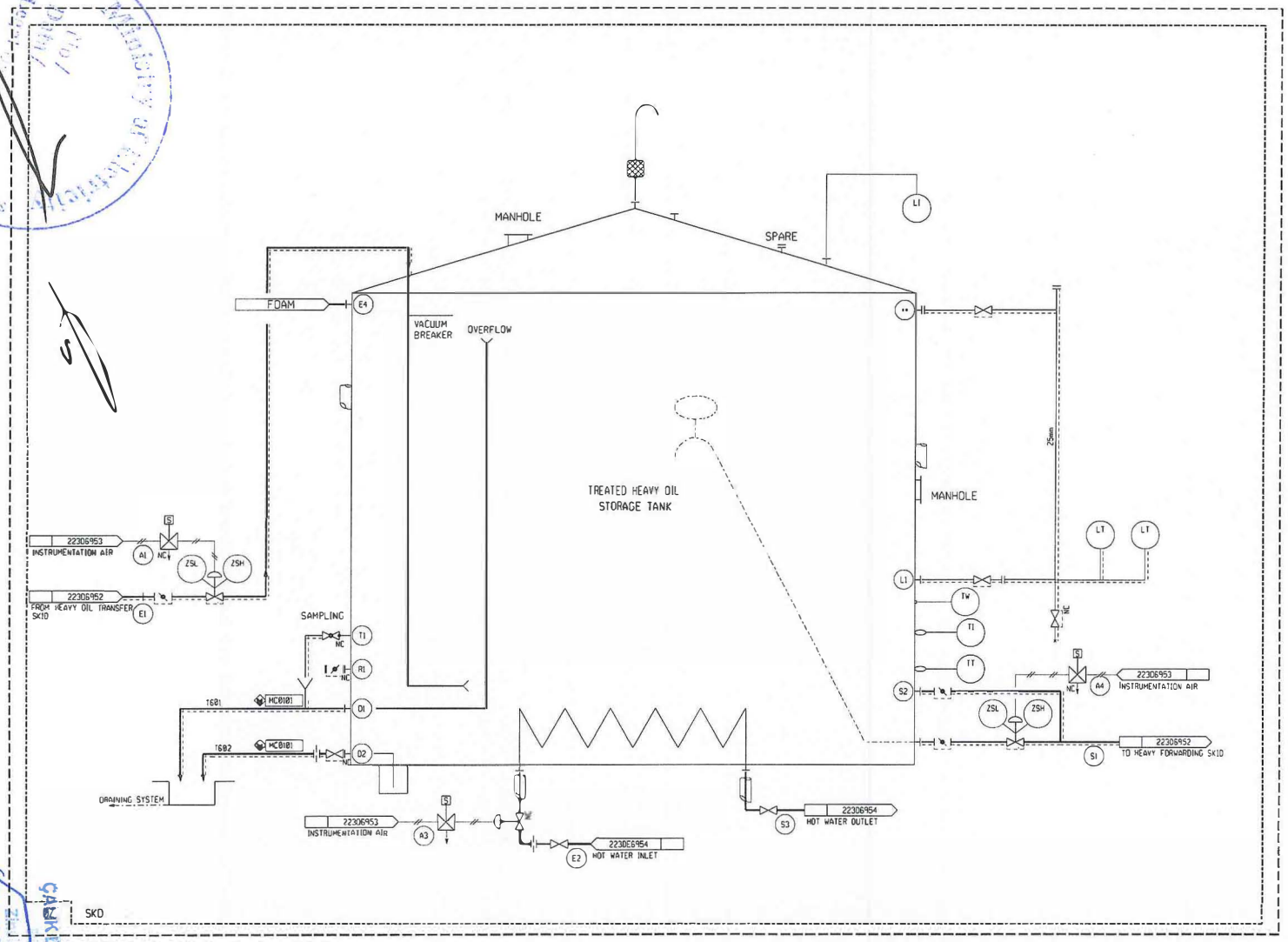


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RESERVOIR DE STOCKAGE FUEL LOURD TRAITE
TREATED HEAVY OIL STORAGE TUNK

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Director General
Legal Affairs Department
Section of Contracts
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Büyük Mükellefler V.D. 872 003 3993

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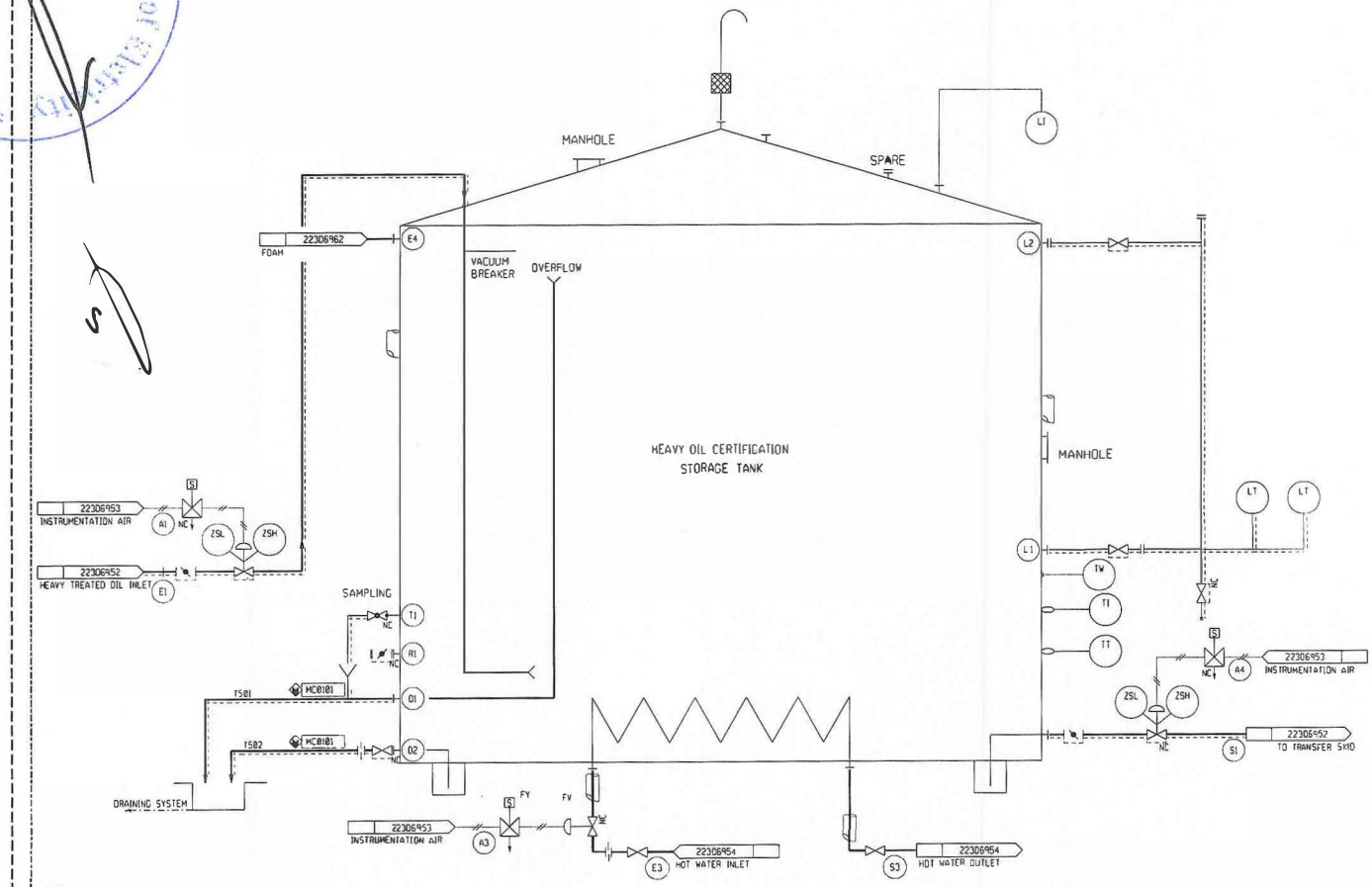


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CERTIFICATION HEAVY FUEL OIL STORAGE TANKS

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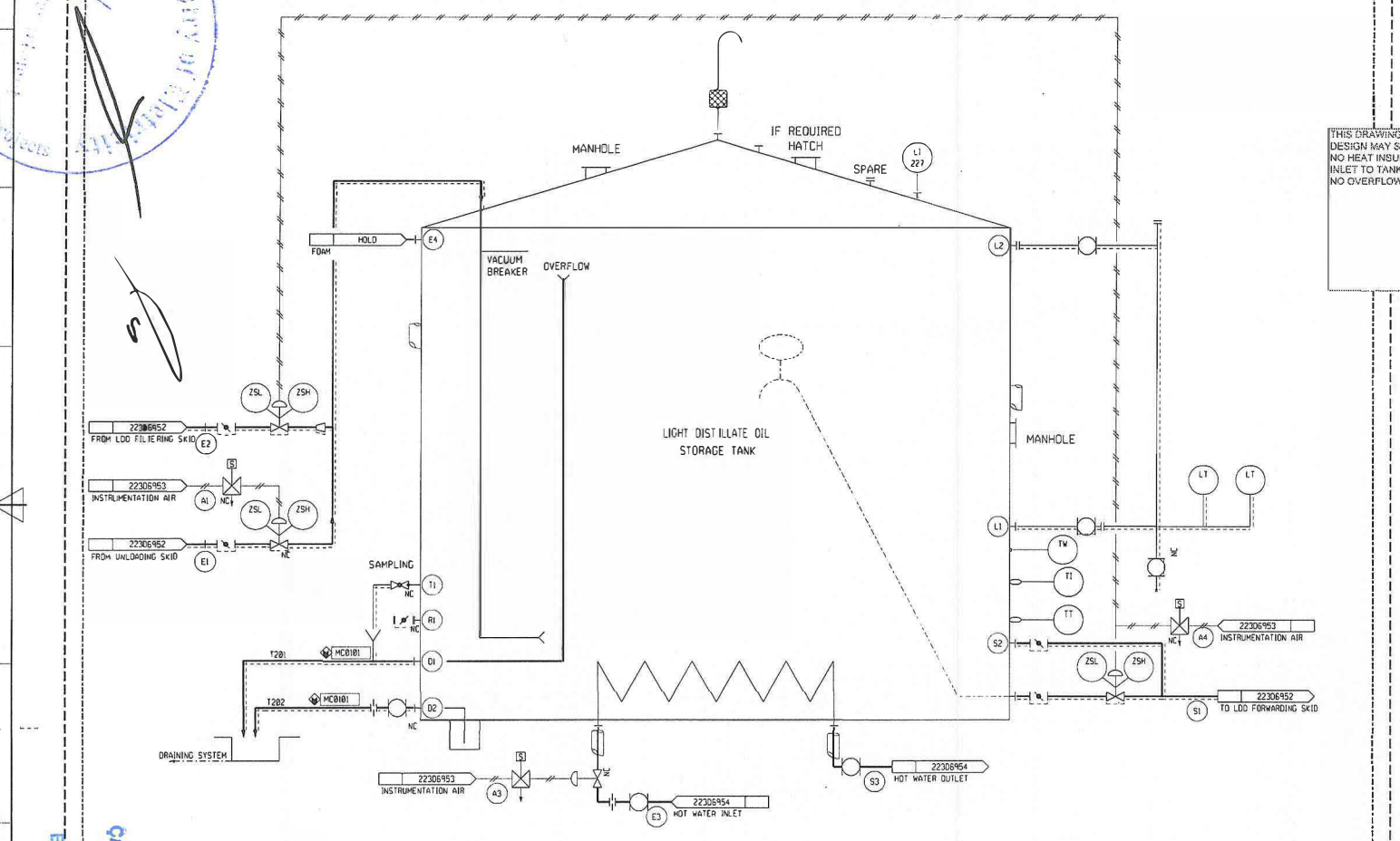


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LIGHT DISTILLATE OIL STORAGE TANK

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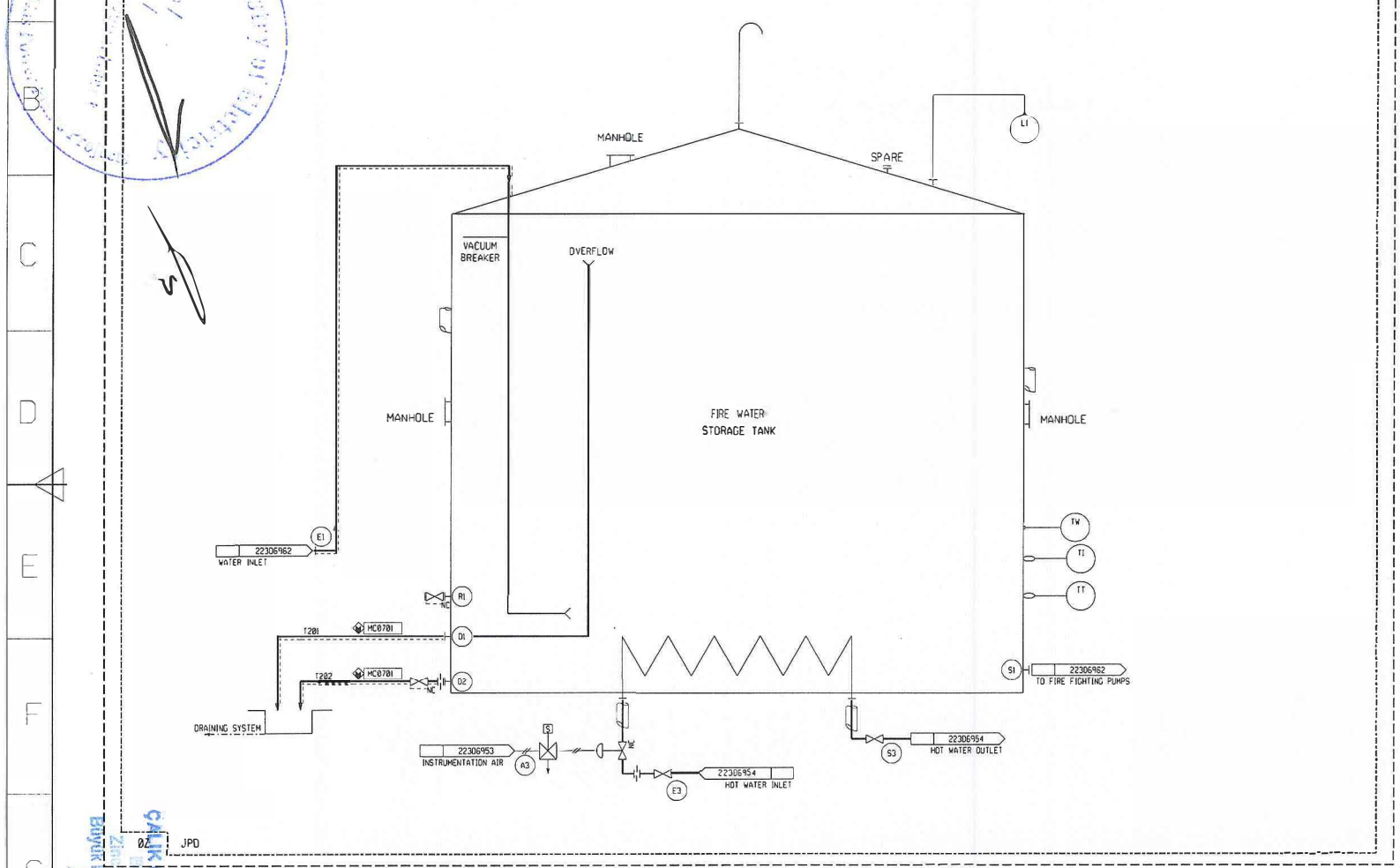


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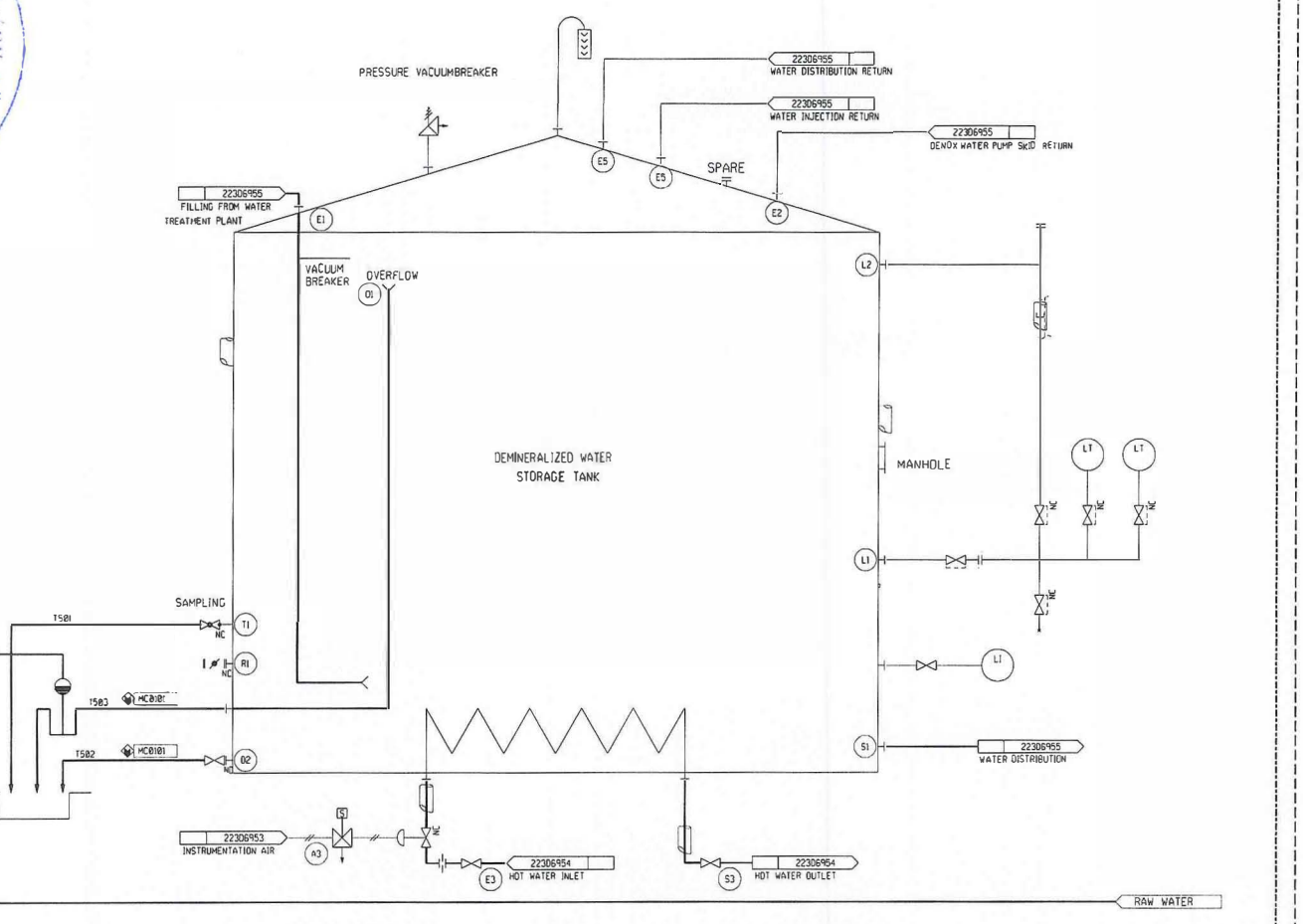


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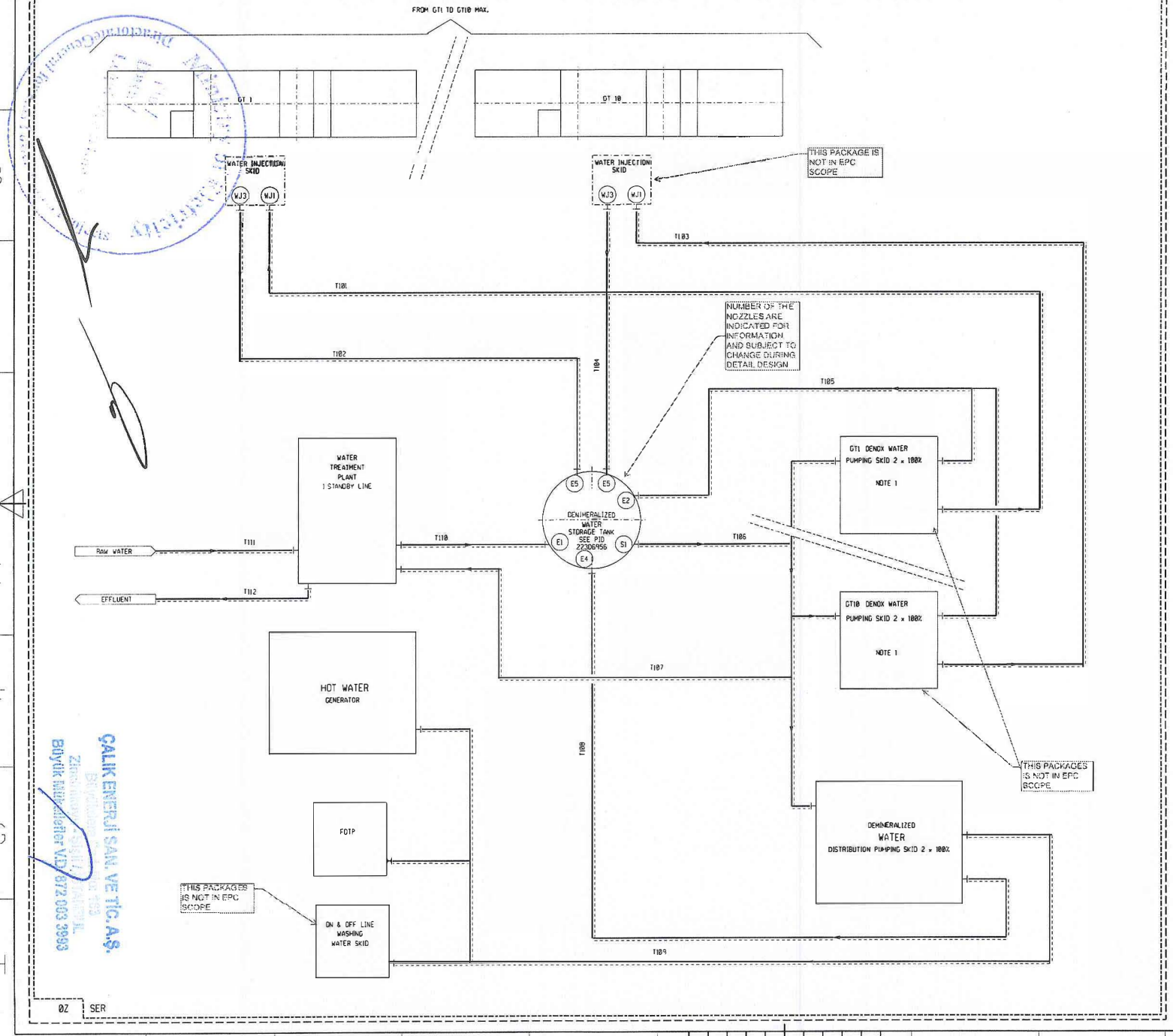


NOTE 1: PUMPING STATION FOR GT1 UP TO GT10 MAX.

NOTES: ALL PIPES WILL BE IN STAINLESS STEEL

VENT VALVE ON EACH HIGH POINT

DRAIN VALVE ON EACH LOW POINT

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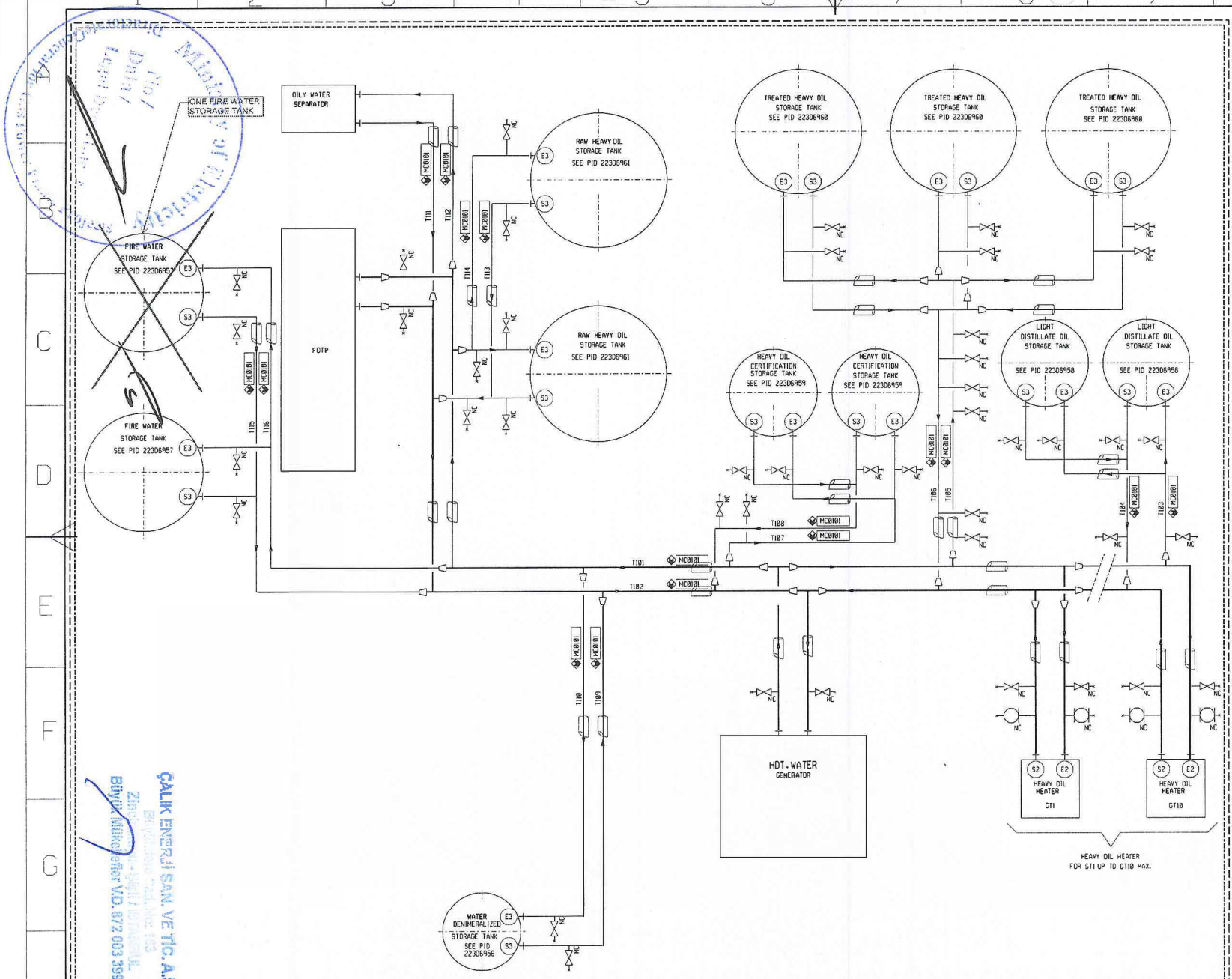


NO HEATING REQUIRED FOR LDO TANKS
NO HEATING REQUIRED FOR OIL SEPERATORS

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HEAT INSULATION

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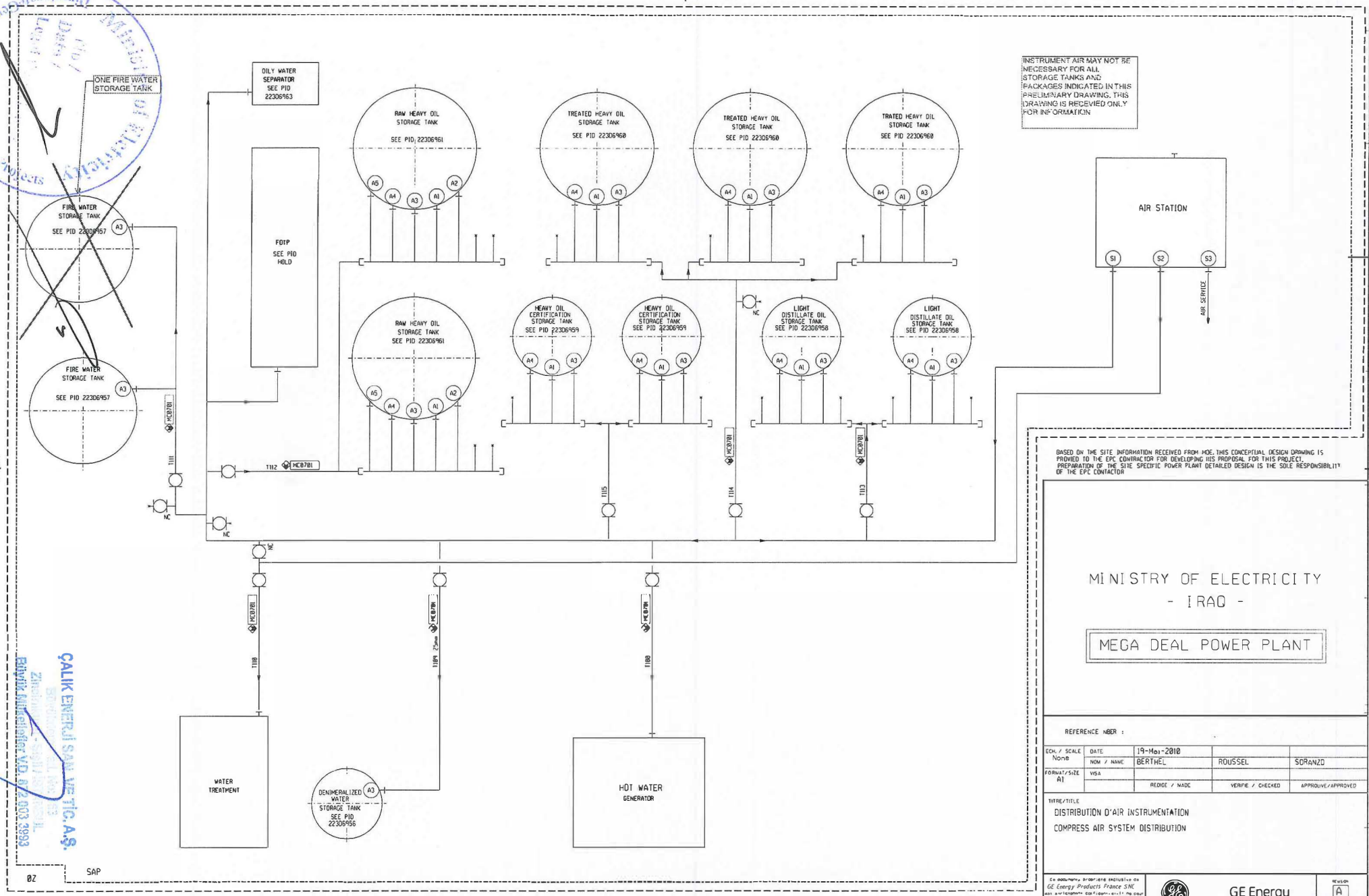


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GE Energy

N° 22306953

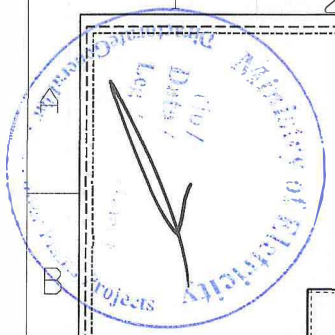
SHEET 1/1

REVISION A
ASTRUCTION DE MODIFICATION
FIRST ISSUE
Section Doc.

ÇALIK ENERJİ SAN VE TİC.A.Ş.
Büyük Mükellefler V.D. 872 003 3993

FORMAT A1:841x594 (ISO 5457-1990)

FORMAT UTILE : (801 x 554)



SKC

LIGHT DISTILLATE OIL UNLOADING SKID

RAW HFO UNLOADING SKID

RAW HEAVY OIL STORAGE TANK
SEE PID 22306961

TREATED HEAVY OIL STORAGE TANK
SEE PID 22306960

HEAVY OIL CERTIFICATION STORAGE TANK 55IBA
SEE PID 22306959

HEAVY OIL CERTIFICATION STORAGE TANK 50IBA
SEE PID 22306959

LIGHT DISTILLATE OIL STORAGE TANK
SEE PID 22306958

HOT WATER GENERATOR

HEAVY OIL TRANSFER SKID

SKD

TP

ØZ

NO HEATING REQUIRED FOR LDO TANKS

NOTE 1:FROM OR TO GT1 UP TO GT10 MAX.

BASED ON THE SITE INFORMATION RECEIVED FROM MOE,THIS CONCEPTUAL DESIGN DRAWING IS PROVIED TO THE EPC CONTRACTOR FOR DEVELOPING HIS PROPOSAL FOR THIS PROJECT. PREPARATION OF THE SITE SPECIFIC POWER PLANT DETAILED DESIGN IS THE SOLE RESPONSIBILITY OF THE EPC CONTACTOR

MINISTRY OF ELECTRICITY
- IRAQ -

MEGA DEAL POWER PLANT

REFERENCE NBER :

| ECH. / SCALE | DATE | | | |
|---|---|---|---|---|
| None | NOM / NAME | BERTHEL | ROUSSEL | SORANZO |
| FORMAT/SIZE A1 | VISA | REDIGE / MADE | VERIFIE / CHECKED | APPROUVE/APPROVED |

18-Mai-2010

TITRE/TITLE

SYSTEME FUEL
LIQUID FUEL SYSTEM

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# BASIC CONTRACTUAL REGULATIONS FOR CONCERNING THE SUPPLAY FUEL TREATMENT SYSTEM NAINAWA GAS POWER PLANT PROJECT

1- Submit your original copy of offer in two separate part (technical & commercial) before the closing date and inside closed stamped envelope, the offer should be signed by managing director of the company or any authorized person in your country otherwise it will be rejected.

2- Certificate of establishment of the company certified by the Iraqi embassy in the country of the company introduces the tender and translated to Arabic (for foreign Companies).

   i - Financial statements for the last year certified by the Iraqi embassy in the country of the company translated Arabic (for foreign companies)

   ii - Similar business of the company for the last 3 years inside or outside Iraq.

3- The total amount of the tender should be in write and digits.

4- Specify the origin of materials.

5- Specify the period of delivery in days starting from the date of opening L/C (CIF) Um Qassir port.

6- Specify the period of warranty.

7- The validity of the offer should be not less than (3) months from the date of submission.

8- Terms of payment equal 100% amount under irrevocable letter of credit as follow-:

i 10% advance payment against an advance payment guarantee to be issued by certified bank in Iraqi equal to ten percent (10%) of the total contract value and in same currency.

ii 30 %from each shipment paid upon presentation of the following documents (commercial invoices, certificate of origin certified by the chamber of commerce and the Iraqi embassy in the country of origin, airway bill, inspection certificate issued by bureau VERITAS, insurance policy packing list, multimodal transport document.

iii 60% from the total contract value paid upon CIF/Um Qassir port delivery of materials and issuance of acceptance certificate issued by beneficiary accepted by applicant.

9- After the award letter and before signing the contract , the contractor should issue a performance bond equivalent to the amount of five percent of the total amount from certified bank in Iraq and shall automatically expired upon end of contract and warranty period (if exist

10- Delay penalty; if the second party (the supplier) fails to deliver the materials within the delivery cycle for reasons attribute able solely to him then delay penalty shall be applicable in accordance with the following formula.

Total contract price / delivery cycle in days x 15% = delay penalty for each day of delay beyond the delivery cycle.
The total amount of delay penalty payable shall not exceed 10% of the total amount of contract

11- The contractor shall present the registration documents of its entity in order to get a statement confirming whether he is exempted from tax or not.
12- The law of collection of government debts no. 56 for the year 1977 applies to the contract.
13- The contract shall be governed by the laws of Iraq.
14- Exclusion the bid of less than or more than 20% of the estimated cost allocated for award purposes.
15- The bidders shall confirm by writing officially to MOE their readiness to participate within (3) day from the date of the invitation
16- Technical bid must be delivered by hard and soft copies to the office: commercial department, poor Saeed Street, Nile qtr. next to Neuro. Medical. Hospital, Baghdad on or before ( 11 / 12 / 2016) time: 12: 00 pm) (Iraq local time) e-mail:commercial@gppproject.com.
17- The approximate estimation budget of the project will be around (7.000.000$ USD ). .The receipt of the material in the warehouses of the projects above .
18- The contract is subject to deduction of tax by 2.7% of the contract value .
19- Stamp fees (0.002) two per thousand from the Contract value with currency paid before signing the Contract.
20- The invitation is subjected to the instructions of executing governmental contracts no.2 -2014, which gives us the wright of cancelling the invitation before issuing the letter of award.

**Hope to receive your offer within the required date.**
**Best regards**

**Attachment:**

- Description of Fuel treatment System.

REPUBLIC OF IRAQ
MINISTRY OF ELECTRICITY
Directorate General For Gas

**Rahman J. Asker**
**Commercial Manager**
23/11/2016

23/11

# Crude oil for nainawa project

| characteristics | results |
|---|---|
| Specific gravity @15C° | 0.85 |
| API | 28 |
| Kinematic viscosity Cst @37.8C° | 6.69 |
| @20C° | 10.6 |
| Pour point © | -15 |
| R.V.P @37.8C (psi) | 6.9 |
| B.S.&W content (vol%) | 0.1 |
| Sulpher content (wt %) | 4.5 |
| $H_2S$ (PPm) | 20 |
| Conradson carbon residue (wt %) | 4.5 |
| Wax content (wt %) | 7.2 |
| Asphaltenes (wt %) | 1.5 |
| Ash content (wt %) | 0.071 |
| Na +K (ppm) | 100 |
| Calcium (ppm) | 1.2 |
| Vanadium (ppm) | 45 |
| Nickel (ppm) | 14 |
| Iron (ppm) | 5 |
| Lead (ppm) | 0.2 |
| Copper (ppm) | 0.5 |
| Water content (wt %) | < 0.1 |
| L.H.V Kcal/kg | 10235 |
| G.H.V Kcal/kg | 10885 |
| Nitrogen (ppm) | 1500 |
| Sedement | %0.5 |

spare parts List

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **A2** | **Crude Oil Treatment Plant:** | | | | |
| | | A2.1 | Motor for centrifuges | No. | 2 | | |
| | | A2.2 | Complete centrifuge disc assemblies including shafts , bearings seals, gaskets etc. | Set | 1 | | |
| | | A2.3 | Motors set of bearings and shaft seals for each type of pump | Each Type | 1 | | |
| | | A2.4 | Feed stop valve (manual) | No. | 2 | | |
| | | A2.5 | Air operated feed valve | No. | 2 | | |
| | | A2.6 | Pressure indicator gauges | Each Type | 2 | | |
| | | A2.7 | Effluent failure pressure switch | Nos. | 2 | | |
| | | A2.8 | Back pressure valve | Nos. | 2 | | |
| | | A2.9 | High back pressure switch | Nos. | 2 | | |
| | | A2.10 | Outlet check valve | Nos. | 2 | | |
| | | A2.11 | Water sensor | Nos. | 2 | | |
| | | A2.12 | Outlet isolation valve. | Nos. | 2 | | |
| | | | **Crude Oil Forwarding Pumps:** | | | | |
| | | A2.13 | Motor | Nos. | 1 | | |
| | | A2.14 | Rotor assemblies | Nos. | 1 | | |
| | | A2.15 | Bearings | Sets | 2 | | |
| | | A2.16 | Mechanical seals | Nos. | 2 | | |
| | | A2.17 | Filter Elements | Nos. | 20 | | |
| | | A2.18 | Coupling insert | Nos. | 2 | | |
| | | A2.19 | Shaft sleeves | Nos. | 2 | | |