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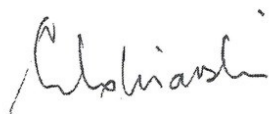
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1. INTRODUCTION

The intention of this guideline is to provide a consistent approach to the design of the diesel oil system to standardise equipment selection and to ensure the correct design documentation is available when needed.

The diesel oil plant supports operation of the emergency unit generation plant, operation of fire pumps and at some stations operation of compressors.

The emergency power supplies are designed to meet the following objectives.

- Allow safe shut down of the plant if normal power supplies are interrupted and unavailable.
- Maintain communication, instrumentation and protection facilities for certain periods following normal power supply interruptions and unavailability.
- Provide essential emergency lighting, even during plant maintenance interventions.
- Keep plant in a state of readiness, where practicable, for rapid re-start when the normal supplies are restored.
- Prevent critical instrumentation from tripping plant in the event of temporary power supply interruptions of the normal power supplies.
- Enable diesel oil restoration of the national grid from a power generating plant perspective.
- Ensure uninterrupted power supply through sufficient redundancy in design for the stated power supply standby period.

The guideline for the diesel oil storage and distribution system is written with new installations in mind but can also be applied to modifications on existing installations. When applying the guideline to existing installations it is important to understand the design approach used for the existing installations and to select equipment similar to the equipment in the existing installation.

The OCGT plant fuel system is excluded from this document.

2. SUPPORTING CLAUSES

2.1 SCOPE

The document addresses the Diesel fuel oil supply, storage, off-loading and distribution in the Coal fired Power Stations for diesel generators and fire pumps.

It includes:

- Design process and documentation requirements
- System design in concept, basic and detailed design stages
- Design interfaces
- Equipment selection
- Test and commissioning requirements

2.1.1 Exclusion

- Gas turbine plant
- Nuclear plant

2.2 PURPOSE

The purpose is to provide guidance to the optimised design of Eskom diesel oil storage and distribution system.

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The document is to ensure a complete and accurate systems design which considers and optimises the use of all the stakeholders while also complying with respective Eskom standards and legislative prescriptions

2.2.1 Applicability

The document will be applicable to Eskom coal fired power stations

2.3 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.4.1 Normative

- [1] Act 85 of 1993 Occupational Health and Safety Act (OHSA) (major hazard installation regulations)
- [2] ISO 9001 Quality management system
- [3] API 620 Design and construction of large, welded low pressure storage vessels
- [4] API 650 Welded steel tanks for oil storage
- [5] API 610 Centrifugal pumps for petroleum products
- [6] API 676 Compliant rotary pumps
- [7] API 2000 Venting atmospheric and low pressure storage tanks
- [8] API RP 2003 Protection against ignition arising out of static, lightning or stray currents
- [9] API 653 Tank inspection, repair, modification and reconstruction
- [10] EN 14015 Specification for off-site built steel tanks for storage of liquids at ambient temperature and above
- [11] SANS 10108 The classification of hazardous locations
- [12] SANS 10086 the installation, inspection & maintenance of equipment used in explosive atmosphere
- [13] SANS 10089-1 The petroleum industry Part 1 Storage and distribution of Petroleum in above ground bulk installations
- [14] SANS 10089-2 The petroleum industry Part 2 The electrical and other installations
- [15] SANS 10131 Above ground storage tanks for petroleum products
- [16] SANS 347 Categorization and conformity assessment criteria for all pressure equipment
- [17] SANS 342 Automotive fuel. Requirements and test methods for diesel
- [18] SANS 62 Steel pipes part 1 and 2
- [19] SANS 1123 Flanges of steel pipes
- [20] 240-54937450 Fire Protection and life safety design standard
- [21] 240-69258336 Pressure release valves
- [22] 240-57617975 Procurement of Power Station Low Voltage Electric Motors Specification Standard
- [23] 240-56030588 Centrifugal pumps standard
- [24] 240-56176852 Capacity of essential Power Supplies for Power Stations

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2.4.2 Informative

- [25] 240-56030537 Specification for centrifugal pumps
- [26] SANS 10189-3 The installation of below ground storage tanks
- [27] ISO 2548 Centrifugal, mix flow and axial pumps acceptance test
- [28] ASME 31.4 Pipeline transportation for liquid carbohydrates
- [29] 240-83797789 Standard Specification for fuel oils for coal fired boilers
- [30] SANS 10189-3 The petroleum industry Part 3 The installation of underground storage tanks
- [31] 240-50237155 New MV Motor Procurement Standard
- [32] 240-52843929 Engineering Design Process Reference Guideline
- [33] SANS 606-1 Qualification of welders
- [34] 240-56355466 Alarm Management System Guideline
- [35] 240-56355843 Pressure Measurement Systems Installation Standard
- [36] 240-56364542 Standard for Reinforced Concrete Foundations and Structures
- [37] 240-56364545 Structural Design and Engineering Standard
- [38] 240-60782552 Process Flow Diagram Standard
- [39] 240-61227631 Piping and Instrumentation Diagram (P&ID) Standard
- [40] 240-68604731 Design Base Standard
- [41] SANS 10162 The structural use of steel
- [42] SANS 10400 The Application of National Building Regulations
- [43] SANS 2001-DP8 Construction works, Part DP8: Pipe Jacking
- [44] 240-53113685 Design Review Procedure
- [45] 240-53114002 Engineering Change Management Procedure
- [46] 240-53458738 Process Control Manual (PCM) for Perform Low Pressure Services Engineering

2.4 DEFINITIONS

Definition	Description
Absolute viscosity	Dynamic viscosity of fluid (Pa s), Viscosity decrease with increasing temperature
Diesel oil	Distillate petroleum product (light or medium distillate)
Distillate fuel	Product in mid boiling range derived from distillation of crude oil in distillation column
Flash point	Indication of maximum storage temperature without causing fire hazard
Flash point	A lowest temperature at which vapour above liquid will ignite with application of small flame (SANS 10089-1)
Kinematic viscosity	Ratio of absolute viscosity to density (mm ² /s)
OCGT	Open cycle gas turbine
Oil industry product exchange specification	The industry regulator for quality of oil supplied by different suppliers

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Definition	Description
Pour point	Indication of lowest temperature at which oil can be stored and still is capable to flow under minimum pressure
Residual fuel	A fuel composed mainly of unevaporated materials after the atmospheric distillation of crude oil
Service tank	Auxiliary storage tank which have a capacity below 1000 l
Skid tank	Above ground tank 9000 l, 14000 l or 23000 l in volume which can be dragged over short distances, normally used for construction sites

2.4.1 Disclosure Classification

Controlled Disclosure – Controlled Disclosure to external parties (either enforced by law or discretionary)

2.5 ABBREVIATIONS

Abbreviation	Description
AIA	Approved Inspection Authority
API	American Petroleum Industry
ASME	American Society of Mechanical Engineers
ASTM	American Standard Testing Method
C&I	Control and Instrumentation
CCGT	Closed Circuit Gas Turbine
CF1,.CF2	Clean fuel 1 and 2 (SANS 342)
CoE	Centre of Excellence
cSt	Centistokes. Kinematic viscosity measured in mm ² /s
FEMCA	Failure Mode and Criticality Analysis
GT	Gas Turbine
HAZOP	Hazard and Operability
LFO	Light Fuel Oil
LP	Low Pressure
LV	Low Voltage
MV	Medium Voltage
NEC	New Engineering Contract
NPSH	Net Positive Suction Head
OCGT	Open Cycle Gas Turbine
OEM	Original Equipment Manufacturer
P&ID	Piping and Instrumentation Diagram
PER	Pressure Equipment Regulation
PF	Point of Firing
PTFD	Pressure Test Flow Diagram
RAM	Reliability Availability Maintainability
RBI	Risk Based Inspection

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Abbreviation	Description
Re	Reynolds number gives relative ratio of inertia to viscous forces
SAPIA	South African Petroleum Industry Association
SC	Study Committee
SCOT	Steering Committee of Technology

2.6 ROLES AND RESPONSIBILITIES

2.6.1 Responsibilities over this document

Role	Responsibility
Compiler	The document compiler is responsible for ensuring that this document is up-to-date and that this document is not a duplication of an existing documentation, regarding the document's objectives and content
Functional Responsibility	The Functional Responsible Person shall determine if the document is fit for purpose, before the document is submitted for authorisation
Authoriser	The document authoriser is a duly delegated person with the responsibility to review the document for alignment to business strategy, policy, objectives and requirements. He/she shall authorise the release and application of the document
Care Group Members	Provide input to the Diesel oil system Design Guideline and associated engineering activities
Document Support group	SC chairman to ensure that the document is reviewed and approved as per SCOT requirement

2.7 RELATED/SUPPORTING DOCUMENTS

2.7.1 Related documents to be retained

All documents created during the design process shall be retained.

Documents for review are available on Share Point.

Approved Documents to be electronically stored on Hyperwave

2.7.2 Templates and guidelines

- [47] 240-49910679 Concept Design Report Template
- [48] 240-49910705 Basic Design Report Template
- [49] 240-49910707 Detail Design Report Template
- [50] 240-53113704 Maintenance Engineering Strategy Report Template
- [51] 240-55864360 Mechanical Equipment List Template [MELT]
- [52] 240-56227927 Electrical Load List Template
- [53] 240-57934588 End-of-Phase Design Review Report Template
- [54] 240-60782527 Control Philosophy Report Template
- [55] 240-61227624 Plant Operating Concept Report Template
- [56] 240-61379718 Control & Instrumentation Instrument Schedule Template

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When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

- [57] 240-61379755 Control & Instrumentation Drive & Actuator Schedule Template
- [58] 240-72344339 C&I Virtual Signal List Template
- [59] 240-72350241 C&I Panel Interface List Template
- [60] 240-49230046 Failure Mode and Effect Analysis (FMEA) Guideline
- [61] 240-49230111 Hazard and Operability Analysis (HAZOP) Guideline
- [62] 240-49230148 Maintenance and logistics support Design Guideline
- [63] 240-50056004 Constructability Analysis Guideline
- [64] 240-71432150 Plant Labelling and Equipment Description Standards
- [65] 240-86973501 Engineering Drawing Standard Common Requirements
- [66] 240-52844017 RAM Analysis Guideline

3. DESIGN PROCESSES

Design processes are described in 240-52843929 Engineering Design Process

3.1 DOCUMENTATION REQUIREMENTS IN VARIOUS STAGES OF A DESIGN PROCESS

Table 1: Documents requirement at various stages of the design

	Concept Design	Basic Design	Process Design Freeze	Arrangement design freeze	Mech. design Freeze	Integrated design
Concept design report	X					
Basic design report		X				
Process Design Report			X			
Mechanical design report					X	
Integrated design report						X
Process flow diagrams of 'As is' plant		X				
Process flow diagrams	x					
P&ID's of 'As is' plant		X				
P&ID's			X			
Control Narrative			X			
Equipment lists/schedules		X	X		X	
Equipment data sheets					X	
Conceptual plant layout drawings	X					
Basic Plant Layout drawings		X				
Plant Layout Drawings				X		
Pipe and cable routing drawings		X				
Servitude defining drawings				X		
Arrangement drawings					X	

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	Concept Design	Basic Design	Process Design Freeze	Arrangement design freeze	Mech. design Freeze	Integrated design
Piping Isometric drawings					X	
Detail drawings					X	
Hydraulic analysis			X			
Pipe stress analysis					X	
FMEA study		X				
HAZOP study			X			X

4. DESCRIPTION OF PLANT

The following drawing illustrates the requirement for diesel oil at Coal Fired Power station. The diesel oil will be used to fuel diesel generator, fire pumps and other diesel driven equipment (in some stations also compressors).

Medupi Power Station use one diesel oil storage tank, as the tank is used in emergency only. However for the other new built stations this should be investigated from the point of risk and timing for repair or replacement.

Each tank is designed to supply diesel oil to six units.

Below is an example of the diesel oil system at Medupi Power Station

Fig1 Flow diagram of the diesel oil (based on Medupi design)

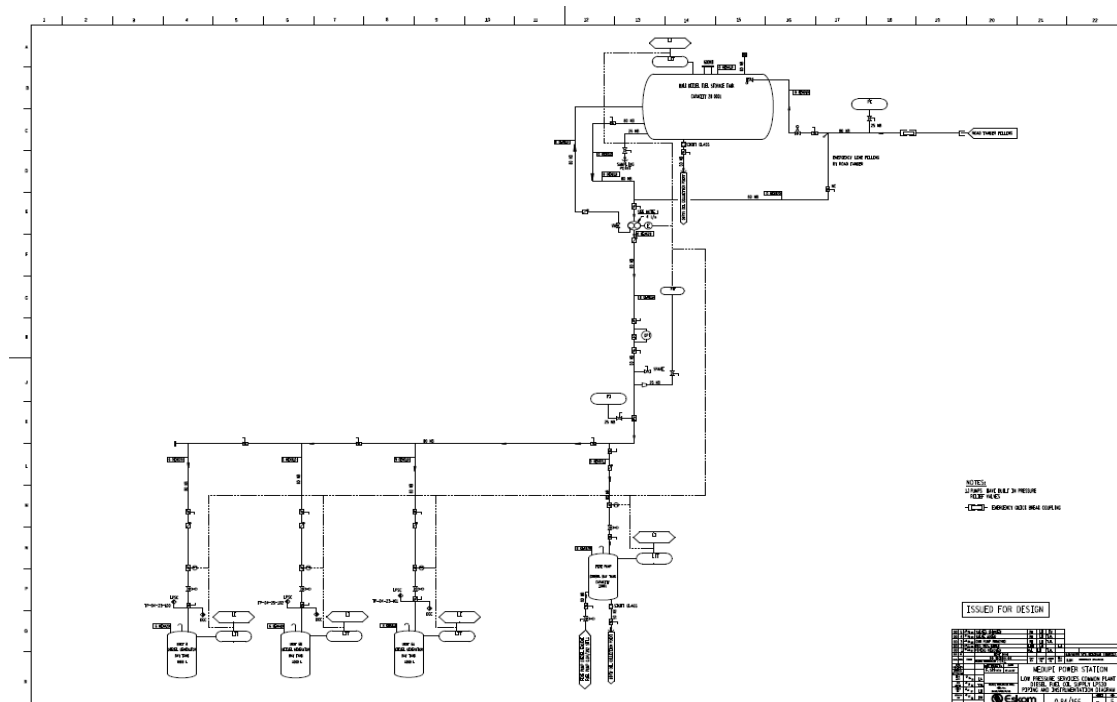


Figure 1: Flow Diagram

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4.1 DELIVERING OF DIESEL OIL

The distillate fuel is delivered by transfer from road tanker into the fuel unloading system pipework.

- The delivery process is described in SANS 10131 section 8 Storage Tank filling operation
- A flexible hose and a breakaway coupling, fitted with API connector and integral non-return valve shall be permanently connected via suction strainer to piping. The hose size shall ensure low resistance and be at least 100NB.
- The mesh strainer shall be 3 mm holes on suction side of the pumps.
- The suction pipe line shall not be at the bottom of the tank, but in the bottom quarter of the tank to prevent particles from being sucked into pipes.

5. DESIGN CONSIDERATION

5.1 STATUTORY REQUIREMENTS

5.1.1 NFPA requirements

Diesel oil is classified by NFPA standard 30 as either flammable or combustible dependent on the vapour pressure at the indoor design temperature.

5.1.2 PER regulation

5.1.2.1 System vessels

Storage vessels. The vessels operate under atmospheric pressure and are not categorised under PER regulation of OHS Act [1].

5.1.2.2 System piping

Under dangerous liquids SANS 347 categorise piping as follows

- Category I for PS 50-1000 and $PS \cdot DN \geq 200\,000$
- Category II for PS 1000-50 000, $PS \cdot DN > 200\,000$ and $DN > 25$

5.1.2.3 Pressure release valves

Pressure release valves are categorised as safety accessories. Safety accessories manufactured for specific equipment shall be at least classified at the same category as the equipment they protect (SANS 347).

5.1.2.4 Daily oil tanks

Under dangerous liquids SANS 347 categorise the tanks as follows;

The tanks are categorised as category one at volume 1000 litres and PS 50-1000 kPa.

5.1.3 Other regulations

Applicable petroleum Industry standards as listed above item 2.4.1

5.2 TYPE OF OIL USED

5.2.1 Diesel oil classification

The diesel oil is classified according to its sulphur content.

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Table 2: Diesel oil classification

Description	Unit	Requirement	
--	--	CF1	CF2
Standard diesel	mg/kg	500	
Low sulphur diesel	Mg/kg	50	
Low sulphur grade diesel	-	N/A	10
Density	Kg/m ³ @20°C	800	801-947
Flash point	°C	55	
Viscosity	mm ² /s	2.2-5.3	2.2-4.5

Table 3: Classification of petroleum products according to SANS 10087-3

Class of petroleum products	Classification based on SANS10087-3
Class 1 A	Liquid that has a closed cup flash point below 23°C and boiling point below 35°C
Class 1 B	Liquid that has a closed cup flash point below 23°C and boiling point 35°C or above
Class 1 C	Liquid that has a closed cup flash point of 23°C or above but below 38°C
Class 11	Liquids that have flash point of 38°C or above but below 60.5°C
Class 111A	Liquids that have a closed cup flush point of 60.5°C or above but below 93°C
Class 111B	Liquids that have closed cup flash point 93°C or above

Note: According to SANS 10087-3 Diesel is class II

5.3 DESIGN CRITERIA (ASME B31.3)

5.3.1 Internal design pressure

The piping components shall be designed to internal pressure representing the most severe condition of coincident pressure and temperature expressed in normal operation (including fluid head). This shall be that condition which result in greatest required pipe thickness and the highest flange rating.

5.3.2 External design pressure

The piping component shall be designed for the maximum differential pressure (including fluid head) at the coincidental temperature that that can act externally on the component of piping system taking into consideration failure of external and internal pressure.

5.3.3 Design temperature

The design temperature is a metal temperature representing most sever condition of coincidental pressure and temperature.

5.4 DESIGN REQUIREMENTS

5.4.1 Design base

Base for selection of the volume of the storage is the running time for generators according to 240-56176852.

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5.4.2 Impact on environment

Correct handling of spillage, drainage and ventilation will reduce the impact of the plant on environment

5.4.3 Sizing of the plant

The storage tank volume is designed with reserves to continue the standby times for all process information and control for 6 and 12 hours respectively (240-56176852) and to support fire pumps for at least 2 hours [240-54937460].

The historical data on various stations show that tanks are frequently undersized. The availability of fuel and a pattern of fuel delivery will have to be analysed.

The following is based on the Medupi design

- Transfer pump 4 l/s
- Daily oil storage for Unit diesel generator 1000 l (standard size-horizontal)
- Storage tank 28000 l (standard size 30000 l horizontal)

5.4.4 Positioning of the diesel storage tanks

The main diesel storage tank to be positioned in proximity to pump station. Overall station layout shall be considered to make allowance for required clearances (SANS 10089-1) from other equipment and buildings. The tank shall be located during conceptual design of the layout of the station.

The daily diesel tanks shall be positioned outside the station at the height which allow for gravity feed of the diesel to the unit generator and next to the fire pumps to facilitate gravity feed of diesel to the fire pumps.

5.5 DESIGN OF PIPING SYSTEM

- Piping to be preliminary sized at laminar flow. The pressure drop shall be low, especially at the suction of the pumps so pump NPSH is not exceeded.

5.5.1 Friction factor

$$f = 64/Re$$

The friction factor in pipelines can also be calculated as follows

$$f = \frac{h}{(L/D) * v^2/2g}$$

f -friction factor

h -loss of static pressure head due to fluid flow (m)

L -length of pipe (m)

D -internal diameter of pipe (m)

v -velocity (m/s)

g -acceleration of gravity 9.81m/s²

5.5.2 Pressure drop across the fittings

$$\Delta P = k * P_v$$

k —velocity pressure factor (resistance coefficient)

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ΔP -pressure drop

Pv- velocity pressure

5.5.3 Recommended velocity

The velocity in mains to limit pressure drop shall be selected below 2,5 m/s.

5.5.4 Viscosity

Viscosity expresses resistance of flow to the shear

5.5.4.1 Absolute viscosity- μ

The absolute viscosity of the fluid (or dynamic viscosity) is measured in Pa*s or Ns/m² or kg/ms and is expressed as centipoise (cP)

$$1 \text{ Pa} \cdot \text{s} = 10^3 \text{ cP}$$

5.5.4.2 Kinematic viscosity- ν

Kinematic viscosity is expressed in centistokes. It is a ratio of dynamic viscosity to the density and is expressed in centistokes (cSt)

$$\nu \text{ (centistoke)} = \mu \text{ (centipoise)} / \rho \text{ (grams/cubic cm)}$$

5.5.5 Reynolds number

$$Re = d \nu \rho / \mu$$

μ viscosity (centipoise)

ρ -density (kg/m³)

ν -velocity (m/s)

d- diameter (mm)

Table 4: Summary of k factors (after HIVE)

Description	Comment/sizes	K factor
T junction divergent flow and convergent flow	Plus factor for bend following Plus factor for enlargement or contraction	0.5
Tongue flow junction	With inserted control flap	3.0
Reduction of flow	Ratio 2:3	0.3
	Ratio 2:1 and 3:1	0.4
	Ratio 4:1	0.5
Enlargement of flow	Ratio 3:2	0.4
	Ratio 2:1	0.7

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Description	Comment/sizes			K factor
	Ratio 3:1			0.9
	Ratio 4:1			1.0
Gate valve	TBC by manufacturer			0.2
Angle valve	TBC by manufacturer			5
Non return valve	TBC by manufacturer			2 * pipe diameter
Tap or stop valve	TBC by manufacturer			10
Globe or ball valve	TBC by manufacturer			5
Entry into the large vessel				1.0
Exist from large tank				0.4
End user outlet	To be confirmed by burner nozzles designer			5
Bends	10-25mm	32-50mm	65-90mm	100mm and above
90 degree small radius	0.8	0.7	0.6	0.6
90 degree flanged long radius	0.5	0.5	0.5	0.5
45 degree elbow	0.6	0.6	0.5	0.5
Screwed long radius elbow	0.7	0.5	0.4	0.3
Return bend	0.8	0.8	0.8	-

Note: Valves k factors to be confirmed with the equipment manufacturers

6. DESIGN INTERFACES

6.1 LAYOUT REQUIREMENTS

- Minimum clearance from boundary of property (see SANS 10131 table 2 and 3)
- When installed in building 4 hour fire resistance to structure
- When placing against building wall (see SANS 10131)
- Access of the facility to road transport
- Fire protection and fire response time 240-54937450
- Availability of services (water and drainage)

The position of loading and off-loading point shall be selected such that there is ease of access for tankers to off-load and load diesel. Break-away couplings shall be fitted in the loading and off-loading line just after the quick connecting coupling.

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6.1.1 Loading point

The position of the loading point shall be selected such that there is ease of access for maintenance and connection. A Break-away coupling shall be fitted in the loading line just after the quick connecting coupling.

6.1.2 Bund area of the tank

The design shall provide means for effective containment of spillage, where spillage is deemed unavoidable, means shall be provided to facilitate the safe and easy cleaning or removal of such spillage.

The tanks shall be located in a bunded walled area that can contain the full tank volume plus 10%. The bund area floor shall be of a suitable rough concrete slab and shall be sloped to allow rain water drainage to the lowest point.

The clearances are detailed in SANS 10089.

A drainage sump shall be provided inside the bunded area. Ladders with hand rails shall be fitted to provide access to the bund area.

6.1.3 Pump Station

A pump station shall be built next to the bulk diesel oil storage tank.

Shelter shall be provided for protection of the pumps. There shall be a security fence to control access.

The pumps shall be supplied complete with motors, steel support base plates, spillage containers, etc.

Fixed fire protection shall be as per Eskom standard 240-54937450.

Ventilation shall be at high and low level of the enclosure.

6.1.4 Diesel tank for fire pump

The tank shall be complete with concrete base, steel support, access ladders, platforms, hand rails, access manhole, vent valve, level indicator and sampling point. The electrical contractor shall supply and install the earth mat below the slab for earthing.

The tank base shall be sloped to a common position to facilitate complete drainage of the tank.

Fixed fire protection shall be provided as required in Eskom standard 240-54937450

Earthing and lighting protection as required in Eskom standard 240-56356396

6.2 C&I INTERFACE

6.2.1 Design philosophy

Generally the system shall be operated automatically with manual standby:

- Diesel oil shall be pumped from road tankers to the bulk storage tank by opening relevant manually operated valves that will transfer the diesel into the bulk storage tank. The procedure of the oil transfer to be as per SANS 10131.
- The electrically actuated valves shall open when the day-tanks reach the low level. A signal shall be sent to start the pump to have diesel flow from the bulk diesel fuel storage to the day-tanks.
- When the day tanks reach a high level, electrically actuated valves shall automatically close and there shall be a signal which shall be sent to the pump which automatically switches the pump off.

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6.2.2 Local controls in the pump station

- Stop/start buttons for the pump
- Automatic/manual selector for the pump

6.2.3 Local Indications

- Running/stop indications for the pump
- Pump station discharge pressure for the pump
- Bulk diesel storage tank level indicator visible from the filling point
- No alarms and trips in the pump station

6.2.4 Controls and monitoring in the outside plant control room

- Reset alarm
- Running/trip/stop indications for the pump
- Pump station discharge pressure for the pump
- Bulk diesel storage and day tanks level indicators
- The mass based measurement for the fuel oil supply
- Temperature measurements on pump bearing

6.2.5 Alarms in the main control room-visual and audible

- Low level in the bulk diesel storage tank
- High level in the bulk diesel storage tank
- Low level in the day tanks
- High level in the day tanks
- Pump bearing temp trip
- Pump trip

6.3 ELECTRICAL INTERFACE

- Power requirements
- Compliance to Eskom standard 240-56176852 Essential power supplies for Power Station
- Capacity of daily tank for diesel generator
- Compliance to SANS10089-2, SANS10108 and SANS 10142-1

6.4 WATER AND DRAINAGE

6.4.1 Drainage of bund area

- Any spillage should be drained via oil separation sump (fire traps) and pumped into a dirty oil drum
- Dirty oil from fire pump drum shall be collected for controlled disposal
- The storm water and oil mix should be avoided. Drain line shall be fitted with valve. Human intervention might be required.

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6.4.2 Drainage of the tank

The tanks shall have sloped bases to a common position in order to aid in complete draining of the tanks during repair or testing. Solids in the tank shall be flushed using flushing nozzles. The draining of used oil from the storage tank to the road tanker shall be done by an electrically driven gear pump to the suitable containers for removal from the site by road tanker.

6.5 FIRE PROTECTION

- capacity of daily tank for the diesel driven fire pump
- separation of the tanks
- compliance to SANS10089-Part1 [5] and SANS10108 [8]

6.6 CIVIL ENGINEERING INTERFACE

- Input to foundation design

Applicable standard: 240-56364542 Standard for Reinforced Concrete Foundations and Structures

- Input to enclosures design

Applicable standard 240-56364545 Structural Design and Engineering Standard

7. EQUIPMENT

7.1 STORAGE TANK

- The tank to be designed in agreement to approved standard such as EN14015, PD5500, API 650, API 620 or equal. In addition the following standards shall apply
- SANS 10131
- Venting (API 2000),
- Earthing (SANS 10089-2),
- Pipe connections, manhole, seaways, ladders, handrails, gauging equipment, floating roof, diaphragm roof, cathode protection and maintenance facilities. SANS 10089-1
- Welding shall be by qualified welders as requested by SANS 9956-3
- The tank outlets are all fitted with isolating valves and a weight operated oil shut off fire valve.
- Each tank has an inlet valve and pipework from the transfer pump. Overflow pipes are also fitted from the top of the tanks to prevent overfilling. The overflow pipe discharges into the tank bund sump.
- Each tank is fitted with a drain. This is used to drain off the water in the tank and also to take diesel samples for laboratory analysis.
- Float switches are fitted to the top and bottom of each tank. The top switch will cut off the transfer pump to prevent the tank from overfilling. The bottom switch will trip the diesel pumps, to prevent the pumps from running dry and causing damage.
- Each tank is fitted with a vent at its highest point. This is to prevent an internal vacuum being formed when the diesel is drawn out of the tank. If the tank remains under a vacuum, it is possible for the tank to collapse.
- Because the tanks are made of metal, connections are made to earth, to protect them from the effect of lightning.

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- The fact that fumes are heavier than air shall be taken into account when designing the pump house ventilation system.
- Emergency venting shall be provided in case of fire being bursting disc, floating manhole or weak roof of vertical tanks, to prevent failure of bottom shell in vertical tanks or side shells in horizontal tank.

7.2 DAILY OIL TANKS

Daily oil tanks typical size is 1000 litres. This however needs to be confirmed with the end users.

The tanks shall be designed, manufactured and constructed as per requirements of SANS10131.

7.3 PIPING AND FITTINGS

Pipe lines shall be routed over the shortest possible route. Interconnecting pipe work shall allow for independent isolation of the storage tanks.

- Piping sizes greater than 50 NB up to and including 250 NB to be schedule 40, ASTM A106 grade B seamless carbon steel.
- Schedule 80 is used for pipe diameters of 50 NB and below.
- Ball valves have been selected for isolation due to their suitability for the application. They are used in the bulk of applications throughout the installation, for all sizes.
- Wafer type non return valves to be used.
- Pressurise release valves to be as specified in 240-69258336
- Valves and pipes requirements are included in SANS 10131 and SANS 10089-1
- Valves shall include indication that show clearly closed and open position
- Pressure gauges shall be equipped with isolation valves
- The flow control valve to be a V Ball type
- Release air eliminator to be oversized to allow rapid air removal
- Basket strainer for low pressure resistance and reduced risk of spillage

7.4 PROTECTION AGAINST CORROSION

Cathodic protection to be according to SANS 10121

7.5 PUMPS

The unloading pumps to be designed and manufacture according to ISO 2858 supported by local supplier. The centrifugal or positive displacement pumps can be used.

The centrifugal pumps are described in specification 240-56030558 and API 610 and the positive displacement pumps in API 676.

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8. TESTING AND COMMISSIONING

8.1 FLUSHING BEFORE COMMISSIONING

The Contractor shall flush all pipe work with diesel oil supplied by a road tanker.

8.2 TESTING OF TANKS

Inspection and testing of tanks is described in SANS 10131.

8.3 COMMISSIONING/PERFORMANCE TESTING

System performance checks all specified characteristics of the plant, calibration of system instruments and recording of the results in the control room and on the local control panels.

Performance testing to be completed and verified against the performance guarantees stipulated in the equipment supplier's contract documents based on the specified fuels and normalized to standard temperature and pressure values.

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10. REVISIONS

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11. DEVELOPMENT TEAM

The following people were involved in the development of this document:

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N/A

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