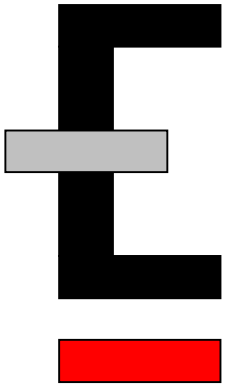

ENERGY REGULATION BOARD

DEPARTMENT OF INFRASTRUCTURE AND OPERATIONS REGULATION

FOSSIL FUELS AUDIT MANUAL

OCTOBER 2008

Table of Contents

1.0 INTRODUCTION

This manual contains guidelines that are implemented by the Energy Regulation Board (ERB) when conducting technical audits. The manual explains how to initiate, prepare and conduct technical audits of different categories as listed below:

a) Energy installations in the bio fuels and fossil fuels subsectors
b) Fuel transportation.

It stipulates the responsibilities of the auditor and the auditee prior to, during and after the audits. Any deviations from this manual must be approved by the Executive Director of the Energy Regulation Board or his formal appointee.

Procedures for conducting technical audits in relation to product quality certification are outlined in the Quality Control and Monitoring Guidelines.
The ERB is a statutory organization established by the Energy Regulation Act Cap 436, 1995 of the Laws of Zambia, to regulate the energy sector with the ultimate goal of ensuring economic and technical efficiency in the sector. This is achieved through the implementation of incentive-based regulation, use of performance benchmarks and enhanced enforcement of standards and regulations.

2.0 QUALIFICATION OF AN AUDITOR

The Auditor shall be an Inspector, appointed under Section 5 of the Energy Regulation Act Cap 436 of the Laws of Zambia, and whose powers are as defined in Section 18.

3.0 AUDIT OVERVIEW

A technical audit is a formal assessment of the extent to which an entity has complied with the laid down technical standards, guidelines and licence conditions. Depending on the objectives of the audit, the auditee may be informed in advance.

3.1 Types of Audits

The ERB conducts the following types of audits:

- Compliance audits
- Licensing audits
- Environmental Impact Assessment (EIA) Review audits
- Accident Investigations and Consumer Complaints audit

3.1.1 Compliance Audits

Compliance audits involve the determination of whether an auditee is complying with the stipulated license conditions, standards and guidelines.

This is achieved through physical inspections of fuel tank vehicles and energy facilities. Appendices A detail the various checklists used when undertaking a Compliance Audit.

3.1.2 Licensing Audits

Licensing audits are carried out when a company applies for a licence. As part of the licensing procedure, the ERB assesses the applicants' financial and technical viability.

The technical assessment for licensing audits is conducted primarily to ensure the following:

- Technical compliance of the applicant to relevant technical guidelines and standards
- Technical capability of key personnel

It involves physical inspection of fuel tank vehicles and the proposed energy infrastructure. The licensing process is not completed until both financial and technical requirements are met.

3.1.3 Environmental Impact Assessment (EIA) Review Audits

The development of energy infrastructure needs to undergo an Environmental Impact Assessment process in line with the provisions of the Environmental Impact Assessment Regulations as read with the Environmental Protection and Pollution Control Act Cap 204 of the Laws of Zambia, 1990.

The developer submits the EIA document to Environmental Council of Zambia (ECZ) for approval. As part of the decision-making process, the ECZ requests for comments from other stakeholders including the ERB.

The ERB's main interest in the EIA process is in fulfillment of one its functions which states ***'****In conjunction with other Government agencies, formulate measures to minimise the environmental impact of the production and supply of energy and the production, transportation, storage and use of fuels and enforce such measures by the attachment of appropriate conditions to licences held by undertakings"*

The ERB conducts the EIA Review Audit as follows:

- Scrutiny of the submitted document to verify if proposed mitigation measures are adequate and appropriate.
- Scrutiny of submitted documentation showing (a) oil interceptor design (b) site layout (c) civil engineering drawings (d) structural engineering drawings (e) architectural drawings and any other relevant drawings to enable determination of compliance with laid down standards listed in Appendix B.
- Physical inspection of the proposed site in presence of the Project Engineers and/or developer to ascertain suitability of the location of the proposed development

3.1.4 Accident Investigation and Consumer Audits

In the event of an accident, the ERB carries out investigations to establish the following:

- Cause of the accident,
- Steps undertaken by the concerned licensee to minimize the impact of the accident,
- Measures put in place to avoid a recurrence of the same,

These cover derailment of petroleum products rail tank wagons, energy installation and road tank vehicle accidents.

In the event of a consumer complaint (usually service and product quality), the ERB carries out investigations to establish the following:

- Validity of the complaint by (a) physical inspection (b) sampling and testing of the fuel samples (c) any other means
- Steps undertaken by the dealer and /or OMC to minimize the impact if the complaint is valid,
- Measures undertaken by the Dealer and/or OMC to avoid a recurrence of the same in accordance with the Quality Control and Monitoring guidelines

3.2 Audit Phases

The following are the phases that must be followed:

- Initiation
- Preliminary survey
- Development of an Audit plan
- Opening meeting
- Detailed testing
- Closing meeting
- Enforcement, resolution, reporting and closure
- Coordination

The sequence is outlined in the table below:

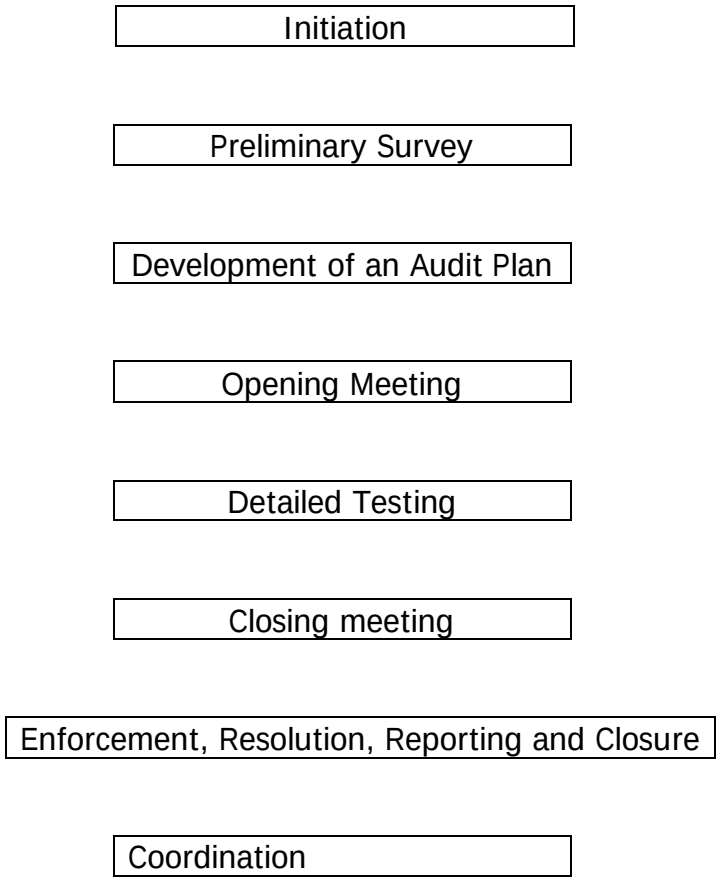

Figure 3.2 Technical Audit Process

3.2.1 Initiation

At the beginning of the audit year or after the Energy Regulation Board (ERB) work plans have been finalized, audit introduction and notification letters are sent out to entities (auditees) selected for comprehensive audits such as state owned companies. A general notification letter to relevant OMCs, with indicative dates, should suffice for retail, consumer and depot facilities.

A comprehensive letter is sent one (01) month before the audit date to:

i. Provide advance notice to the auditee.
ii. Identify audit participants
iii. State the objective and period covered by the audit
iv. Identify the time and date of the opening meeting.

v. Identify the number of auditors in the audit team and the date and length of their on site visit.
vi. Request adequate working space for the auditors
vii. Request the name of the audit contact and address to be used for data requests and any other assessment action that may arise.
viii. Identify the audit coordinator whom the auditee may contact for questions about the notification letter.
ix. Identify auditee records that will be reviewed during the audit.

3.2.2 Preliminary survey

Background information about the auditee is gathered and reviewed during this stage. A survey of the auditee's business activities and systems is carried out to establish an audit plan. Information regarding ownership, policies, practices/ procedures, general and background information necessary to determine the direction and scope of the audit is examined during this stage. In addition, Safety, health, environment and quality procedures, maintenance procedures, operational procedures, fire protection etc are examined and reviewed.

The inspector should ensure that the Auditee is conversant with the following:

i. The Audit Manual
ii. The facility to be audited
iii. Relevant provisions of prescribed standards
iv. Provisions and conditions of the relevant license
v. The Energy Regulation Acts, Petroleum Act, the Environmental Protection and Pollution Control Act and any other relevant legislation.

3.2.3 Audit Design

The scope of work to be carried out and detailed audit steps are defined during this period resulting in the development of an audit plan. Any assistance needed is identified and requested for from the auditee in writing, by phone or email. The request specifies the information required and the urgency.

At the end of this stage, the audit criteria, questionnaires, and checklists to establish conditions expected may be defined (see Appendix A)

3.2.4 Opening Meeting

This is the initial meeting between the auditor (ERB) and the auditee's officials to establish a mutual understanding of the ground rules for conducting the audit. The auditee should designate relevant officials and assign specific tasks which shall ensure the smooth execution of the audit process. The auditor shall explain the audit process, how information will be gathered and the cooperation expected from the auditee.

3.2.5 Detailed Testing

During this stage, the established audit steps are performed and evidence gathered to verify actual conditions and determine conformance. The information gathered will determine the extent of execution of the audit steps. Through out this stage, all the evidence gathered shall be properly documented for effective corrective action.

3.2.6 Closing meeting

The audit is concluded with a closing meeting at which the nonconformances identified are discussed. The auditee should propose corrective action to address the anomalies, as well as proposed completion dates.

3.2.7 Enforcement, Resolution, Reporting and Closure

During this stage, non-compliance reports and enforcement notices are issued and hearings held.

Where the conditions found during the audit do not conform to the stipulated requirements, a non-conformance report should be considered by the concerned auditor, and a request to issue an enforcement notice should be sent to ERB Legal Department (A draft request is sufficient, accompanied by enough documentation supporting the violation). These reports can also serve as the audit reports, therefore the documents must contain sufficient information, including scope of the audit, findings and conclusions and auditee's responses.

Legal Department is expected to review the request and issue an enforcement notice under the signature of the Executive Director/or a delegated authority within 7 days requesting the auditee to show cause why enforcement action should not be taken. The notice should alert the auditee to the fact that non compliance to the directive within a specified period may lead to penalties being invoked.

If the auditee commits to addressing the non conformance within an acceptable period, and manages to meet the deadline, no further action is taken. It is the responsibility of the originating office for the request to issue enforcement action, to advise Legal Department whether the anomaly has been addressed.

All communication between Legal Department and the auditee should be copied to the originating office to ensure the sequence of the enforcement and resolution process is followed closely.

A degree of judgement is expected from the auditor whether the non conformance found warrants preparation of a non conformance report because the procedures triggered as shown above involve time and resources of a number of other persons. A memorandum or letter to the auditee or in the

internal technical audit report may suffice in the recording of minor non-conformances and any actions to be taken. The summary letter to the auditee should state the scope and results of the audit.

Enforcement tools that can be used include warning letters, enforcement notices, penalties, suspension or revocation of licence as per ERB enforcement procedure.

At the beginning of the following audit year, the auditor should issue a summary stating the audits covered in the previous year, list outstanding data requests, and disclose both resolved and unresolved issues as well as identify closed issues.

3.2.8 Coordination

Coordination between regional offices is very important to ensure that the audit mission and the organization's goals are achieved efficiently. Once an anomaly by a company under the portfolio of another regional office is noted, this should be recorded on appropriate audit sheet to ensure a uniform and consistent method of referring important and timely information is established.

REFERENCES

Audit Manual, Royalty Management Program, Release 2.0, January 16, 1998. U.S. Department of the Interior, Minerals Management Service. Written by: Compliance Coordination Office.

Public Works Directives (PWD) Part II Procedural Directives, Chapter 16 Technical Audit, January 2002, Nepal

APPENDIX A – INSPECTION CHECKLISTS

Form/Insp/004

ZAMBIA BUREAU OF STANDARDS
ROAD TANK VEHICLES INSPECTION CHECK LIST

NAME OF COMPANY;.....
COMPANY REPRESENTATIVE:.....
TRUCK REG NO:.....TRAILER NO:.....
COF NO:.....VALID:.....COF NO:.....VALID:.....

FINDINGS:

1.0 GENERAL (a) Appearance (b) Paint (c) Management Responsibility	**6.0 VALVES AND CONTROL** (a) Discharge valves (b) Foot valves (c) Emergency trip control
2.0 CAB (a) Rear window (b) Cab to tank distance (c) Exposed engine shielding (d) Fire extinguishers (e) Document holder	**7.0 HOSE AND HOSE CARRIAGE** (a) Electrical continuity (b) No signs of wear (c) Carriage box
3.0 EXHAUST SYSTEM (a) Position and distance from deliveries (b) Shielding (c) Direction of blowing	**8.0 PUMPS** (a) Safe positioning (b) Correct rating
4.0 ELECTRICAL WIRING (a) Insulation (b) Master switch (c) Earthing points (d) Battery and battery box (e) Lights (f) Electrical Certificate	**9.0 MARKINGS** (a) Hazchem signs (b) No smoking (c) No naked flame (d) Data plate (e) Tank serial number (f) 24hrs contact number
5.0 TANKS (a) Capacities (b) Overturn protection (c) Manholes and filling openings (d) Vents (e) Access ladder (f) Skid proof catwalk (g) Tank mounting (h) Offloading pipes	**10.0 TRAILER** (a) Fire Extinguisher (DCP) (b) Rear bumper (c) Side reflectors (d) Chevron (e) Number Plates (f) Tyres (g) Spare wheel(s)
REMARKS:	

NAME OF INSPECTOR:.....SIGN:.....

DATE:.....

ENERGY REGULATION BOARD
ABOVE-GROUND BULK INSTALLATIONS
CHECKLIST

Business Name:

Location:

Telephone/Fax Number:

Physical Address:

ERB LICENCE No:

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1. FUEL STORAGE TANKS SECTION

TYPE OF TANK	NUMBER OF TANKS	PRODUCT HELD	CAPACITY OF INDIVIDUAL TANK (S)	TOTAL CAPACITY
Fixed-roof tank with weak roof-to-shell seam (atmospheric tank)				
Open-top floating-roof tank				
Internal floating-roof tank e.g. cone-roof tank with internal floating roof				
Low pressure Tank (fixed roof tank with strong roof)				

ADDITIONAL REMARKS:

2. BUND WALL SECTION

Minimum Shell-to-Shell spacing of tanks in the same bund

TANK TYPE	TANK NUMBER	PRDUCT HELD	DISTANCE (X) BETWEEN ADJACENT TANKS (m)	DOES X CONFIRM TO SPACING DISTANCE (SEE BELOW	DISTANCE BETWEEN TANK AND TOE OF BUND WALL	DISTANCE BETWEEN BUND WALL AND A PROPERTY/BUILDING BOUNDARY (M) ♦

				∗:)	(m) ♣	

∗

Floating Roof tanks

- $1/6^{th}$ of sum of adjacent tank diameters but not less than 1m (Tank diameter < 45m)
- 1/4 of sum of adjacent tanks (Tank diameter > 45m)

Horizontal Tanks

- For Class I, II and IIIA Liquids: $1/6^{th}$ of the sum of adjacent tanks but not less than 1m (tank diameter < 45m)
- For Class I or II Liquids: $1/3^{rd}$ sum of adjacent tank diameters (Tank diameter > 45m)
- For Class IIIA Liquids: 1/4 of the sum of the adjacent (Tank diameters >1m)
- Class I Liquid – Petrol
- Class II Liquid – Diesel, Kerosene and Jet A1
- Class IIIA Liquid – Bitumen and Heavy Fuel Oil (HFO)

♣

The minimum distance between a tank and bund wall shall be 1.5m

♦

The minimum distance between bund wall and property/building boundary shall be 3m.

ADDITIONAL REMARKS

3. BUND AREA

VOLUMETRIC CAPACITY OF LARGEST TANK (m^3)	VOLUMETRIC CAPACITY OF BUND AREA (m^3)	HEIGHT OF BUND WALL (≤ 1.8m)	TYPE OF WALL (EARTHEN OR CONCRETE)	IS ACCESS/EXIT TO BUND AREA ADEQUATE?	HOUSKEEPING STANDARDS IN BUND AREA (MUST BE FREE OF COMBUSTIBILE MATERIAL)

ADDITIONAL REMARKS

PRODUCT HELD	TYPE OF FLOOR	ARE SEPERATOR FACILITIES PROVIDED FOR THE WAREHOUSE?	IS ADEQUATE VENTILATION PROVIDED?	IS ENTRANCE TO WAREHOUSE PROVIDED WITH SLOPE TO FACILITATE EASY LOADING/OFFLOADING?	ADEQUACY OF ENTRANCE?	FIRE FIGHTING EQUIPMENT PROVIDED

4. WAREHOUSE FACILITIES

ADDITIONAL REMARKS

5. PUMP FARM AREA

Type of pumps used

☐ Centrifugal

☐ Positive Displacement

☐ Other – Specify

Number of pumps per product	☐	Petrol
	☐	Diesel
	☐	Kerosene
	☐	Jet A1
	☐	Bitumen
	☐	Avgas
	☐	Heavy Fuel Oil
	☐	Light Fuel Oil
	☐	Liquefied Petroleum Gas
	☐	Butane
	☐	Propane
	☐	Reformate

Has spill containment and adequate drainage been provided in pump area	**Yes**	**No**
Are the pumps and pump manifolds located outside the bunded area?	**Yes**	**No**
Do individual pumps have relevant colour coding or any other means of identification?	**Yes**	**No**

ADDITIONAL REMARKS:

6. LOADING/OFFLOADING AREA

*** Check on 15m-separation distance required?

Method of loading	☐	Top-loading (by gravity)
	☐	Bottom-loading
Is loading equipment automatic or manual?	☐	Automatic
	☐	Manual
Has an emergency shut-off (stop) valve been provided for the loading equipment?	☐	Yes
	☐	No

Is this emergency shut-off valve located away from risk area (i.e. loading area)?	**Yes**	**No**
Is earthing and bonding provided for the loading/offloading facilities?	**Yes**	**No**
Is there easy access for trucks to the loading bay (NB: trucks should not have to reverse)?	**Yes**	**No**
Does the depot have a rail siding?	**Yes**	**No**
Does the spill containment arrangement e.g. dykes, channels etc at the rail and truck loading areas lead into the oil separator system for the depot?	**Yes**	**No**
What is the distance between the loading/offloading siding and the nearest tank shell, building or next running rail line? (N.B: This distance should not be less than 15m)		
Is the depot well surfaced?	**Yes**	**No**

If not, please give details of shortfall of the depot surface.

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____

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Does the depot provide for an oil separator/interceptor system?	**Yes**	**No**
Is the oil separator/interceptor system in good working condition and free of debris?	**Yes**	**No**
Are lines, pipes and valves colour coded/marked to allow for identification of intended product or service use?	**Yes**	**No**
What is the condition of the delivery hoses?	**Good**	**Bad**
Are hoses pressure tested at least once a year?	**Yes**	**No**
Are records of such pressure test available?	**Yes**	**No**
Are motors of pumping equipment of the explosion-proof type?	**Yes**	**No**
Are personnel provided with protective clothing for loading and offloading operations?	**Yes**	**No**

7. FIRE PRECAUTIONS AND CONTROL

Is there a layout plan of the depot clearly displayed in an easily accessible location?	**Yes**	**No**
Are tank numbers painted in two positions? (characters should be of minimum height 290mm and minimum width 25mm)	**Yes**	**No**
Are warning signs against shunting during loading/offloading operations, displayed near entrances to sidings?	**Yes**	**No**
Have depot operatives been given fire-fighting training?	**Yes**	**No**

How often are fire drills conducted?

Type of fire fighting equipment available

- ☐ Fire hoses
- ☐ Portable and mobile fire extinguishers
- ☐ Fire water supply
- ☐ Fire engine
- ☐ Foam system
- ☐ Automatic/manually activated sprinkler system
- ☐ Fire alarms
- ☐ Sand buckets/pits

How often are fire drills conducted?

Are records of equipment inspections / test and fire drill practices maintained?	**Yes**	**No**
Are adequate numbers of warning notices or symbolic signs displayed throughout the depot?	**Yes**	**No**
What colour has been used to paint fire fighting equipment?		
Are emergency telephone numbers such as numbers of Fire Services, Key Personnel and other Emergency Numbers, recorded and clearly displayed near every telephone, control center and by the gate?	**Yes**	**No**

ENERGY REGULATION BOARD

TECHNICAL AUDIT FORM

Name of Business:	
Physical Address:	
Town:	
Date:	

No	Issue	Current status	Work Instruction	Deadline
1	Tanks Installed			
2	Positioning of tanks			
3	Leak Detection			
4	Water Dip			
5	Fuel Dispenser			
6	Preset Dispensing			
7	Dispenser Access Panels			
8	Pump Island Crash Barriers			
9	Filler Box Position			
10	Filler Box Volume			
11	Product Colour Coding			
12	Price Display			
13	Forecourt			

14	Forecourt Drainage			
15	Interceptor			
16	Emergency Shut Off Switch Location			
17	Electrical Wiring - MCB			
18	Electrical Wiring - Canopy			
19	Vent Pipes Position			
20	Vent Pipes Height			
21	Fire Extinguisher Validity			
22	Fire Extinguisher Type			
23	Sand Bucket			
24	Compressor			
25	Pressure Gauge			
26	Tyre Inflator			
27	Flushing Toilet			
28	Overfill Protection			

Name of Inspector:

Signature:

Date:

I acknowledge the contents of the above document as has been served upon me by the above named ERB Official.

Name of Company Official

Position:

Signature:

Date:

APPENDIX B – APPLICABLE STANDARDS

a) ZS 369 Automotive Gas Oil (Diesel Fuel) – Specification

b) ZS 370 Leaded Petrol (Gasoline) for Motor Vehicles – Specification

c) ZS 384 Illuminating Kerosene – Specification

d) ZS 426 Liquefied Petroleum Gases – Specification

e) ZS 394 Aviation Turbine Fuel – Specification for Jet A1

f) ZS 420 Burner Fuel Oils for Non-Marine Use – Specification

g) ZS 422 Bitumens for Building and Civil Engineering
Part 1: Penetration Grade Bitumens - Specifications

h) ZS 422 Bitumens for Building and Civil Engineering
Part 2: Cutback Bitumens – Specifications

i) ZS 422 Bitumens for Building and Civil Engineering
Part 3: Anionic Bitumen Road Emulsions - Specifications

j) ZS 422 Bitumens for Building and Civil Engineering
Part 4: Cationic Bitumen Road Emulsions - Specifications

k) ZS 716 Lead Replacement Petrol (Gasoline) for Motor Vehicles – Specification

l) ZS 395 Unleaded Petrol (Gasoline) for Motor Vehicles – Specification

m) ZS 702 Automotive Biodiesel – Specification

n) ZS 706 Specification for Denatured Fuel Ethanol for Blending with Gasoline for use as Automotive Spark-Ignition Engine Fuel

o) ZS 429 The handling, storage and distribution of liquefied petroleum gas in domestic, commercial and industrial installations
Part 4: Transportation of LPG in bulk by road - Code of Practice

p) ZS 704 Transportation Pipeline Systems for Liquid Hydrocarbons – Code of Practice

q) ZS 673 Rail Tank Wagons – Specifications

r) ZS 402 The Classification of Hazardous Locations and the Selection of Electrical Apparatus for use in such Locations – Code of Practice.

s) ZS 604 The Petroleum Industry – Code of Safe Practice

Part 1: Fire precautions at petroleum refineries and bulk storage Installations

t) ZS 604 The Petroleum Industry – Code of Safe Practice
Part 2**:** Part 2: Tank Cleaning Safety Code

u) ZS 604 The Petroleum Industry – Code of Safe Practice
Part 3: Pressure Vessel Examination

v) ZS 604 The Petroleum Industry – Code of Safe Practice
Part 4: Pressure Piping Systems Examination

w) ZS 604 The Petroleum Industry – Code of Safe Practice
Part 5: Inspections and Testing of Protective Instrumentation Systems

x) ZS 604 The Petroleum Industry – Code of Safe Practice
Part 6: Occupational Health

y) ZS 428 Specification - Glass–reinforced polyester-coated steel tanks for the underground storage of hydrocarbons and oxygenated solvents and intended for burial horizontally

z) ZS 396 Sampling Petroleum Products
Part 1: Manual Sampling of Liquid hydrocarbons

aa) ZS 371 Road Tank Vehicles for Petroleum-Based Flammable Liquids – Specification

bb) ZS 372 Transportation of Petroleum Products: Operational Requirements for Road Tank Vehicles – Code of Practice.

cc) ZS 381 Carbon Steel Welded Horizontal Cylindrical Petroleum Storage Tanks - Specification.

dd) ZS 385 The Petroleum Industry – Code of Practice
Part 1: The Storage and Distribution of Petroleum Products in Above-ground Bulk Installations

ee) ZS 385 The Petroleum Industry – Code of Practice
Part 2: Electrical installations in the distribution and marketing sector

ff) ZS 385: The Petroleum Industry – Code of Practice
Part 3 – The installation of underground storage tanks, pumps/dispensers and pipe work at service stations and consumer installations.

gg) Any other Zambian standards and regulations that may become applicable