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Farmers Indaba

**Safety, Health, and
Environmental Considerations in
Handling Fuel**

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Presentation Outline



1. Applications Of Petroleum Fuels
2. SHE Hazards Of Petroleum Fuels
3. Safe Storage And Handling Of Petroleum Fuels

3.1. Liquid Fuels -ZWS 341:1972

- i. Stores for small containers
- ii. Aboveground Storage Tanks
- iii. Pipelines
- iv. Portable Containers

3.2 LPGas ZWS 960:2012

- i. Cylinder Installations
- ii. Bulk Tanks
- iii. Emergency Action



Applications of Petroleum Fuels

- Fuel for vehicles and machinery
- Fuel for generators
- Green house heating
- Flame weeding
- Crop drying
- Poultry rearing
- Food processing



Safety Hazards of Petroleum Fuels



- Fumes and vapours heavier than air
- Extremely flammable liquids and vapours
- Highly combustible
- Harmful if ingested or aspired
- Skin and eye irritant
- Contains cancer causing chemicals
- Environmental pollution
 - Surface water
 - Ground water
 - Air emissions



Safe Storage And Handling Of Petroleum Fuels

The Storage, Transport And Use Of
Small Quantities Of Flammable
Liquids- ZWS 341:1972



Non Isolated Stores for Small Containers Site

- **Siting**
 - As a separate building (not inside or as part of a building) unless approved
 - An isolated store shall be situated at least 9m from other buildings
 - It shall not contain more than 1050 litres at any one time unless approved by local licensing authority
- **Situation**
 - On the ground storey
 - To allow escape of people and animals
 - Not to endanger any room, building on the premises
- **Means of Access**
 - Adequate means of access for firefighting personnel



Non Isolated Stores for Small Containers - Construction

- **Walls**
 - Shall be of non combustible materials
 - At least one wall shall be an external wall
- **Floors**
 - To be of impervious non combustible material
 - Laid directly on ground that has been well consolidated
- **Roofs**
 - To be of specified concrete slabs unless the building is taller than adjacent buildings or a minimum distance from higher structures



Non Isolated Stores for Small Containers- Construction

- **Doors**
 - Close fitting and hung to open outwards
 - Doorway to have a raised sill to form a bund of 90% of the maximum liquid to be stored
- **Number of exits**
 - Where floor space exceeds 10m², provide adequate and alternate means of escape to the external
- **Ventilation**
 - Shall ventilate to open air
 - Shall have no opening windows
 - Shall have floor and eve level ventilation
 - Forced ventilation where the store is situated within a building



Non Isolated Stores for Small Containers- Construction

- **Lighting**
 - Natural, all windows shall be non opening and glazed with wire woven glass
 - Artificial, installed lighting shall be of the electric type, with flame proof fittings
 - Conduit, all conduit shall be fitted with stopper-boxes
- **Bunding (for isolated store)**
 - Store to be completely surrounded by a 150mm high impervious sill or bund to contain spills and leaks
 - The sill or bund may be an integral part of the walls of the store



Non Isolated Stores for Small Containers – Use

Use of the Store

- The store shall be used for exclusive storage and handling of flammable liquids only
- No single container with capacity more than 210 litres shall be kept in the store
- All doorways shall be unobstructed at all times

Danger Notice

- **“DANGER-FLAMMABLE LIQUID-NO SMOKING”**
- Block letters at least 100mm high and 50mm wide
- Letters must be coloured red against a white background
- Max quantity of fuel allowed in the store must be painted on outer face of the door



Non Isolated Stores for Small Containers – Fire Fighting Equipment

Location

- All hand firefighting equipment shall be located outside the store, adjacent to the entrance door.

Quantity

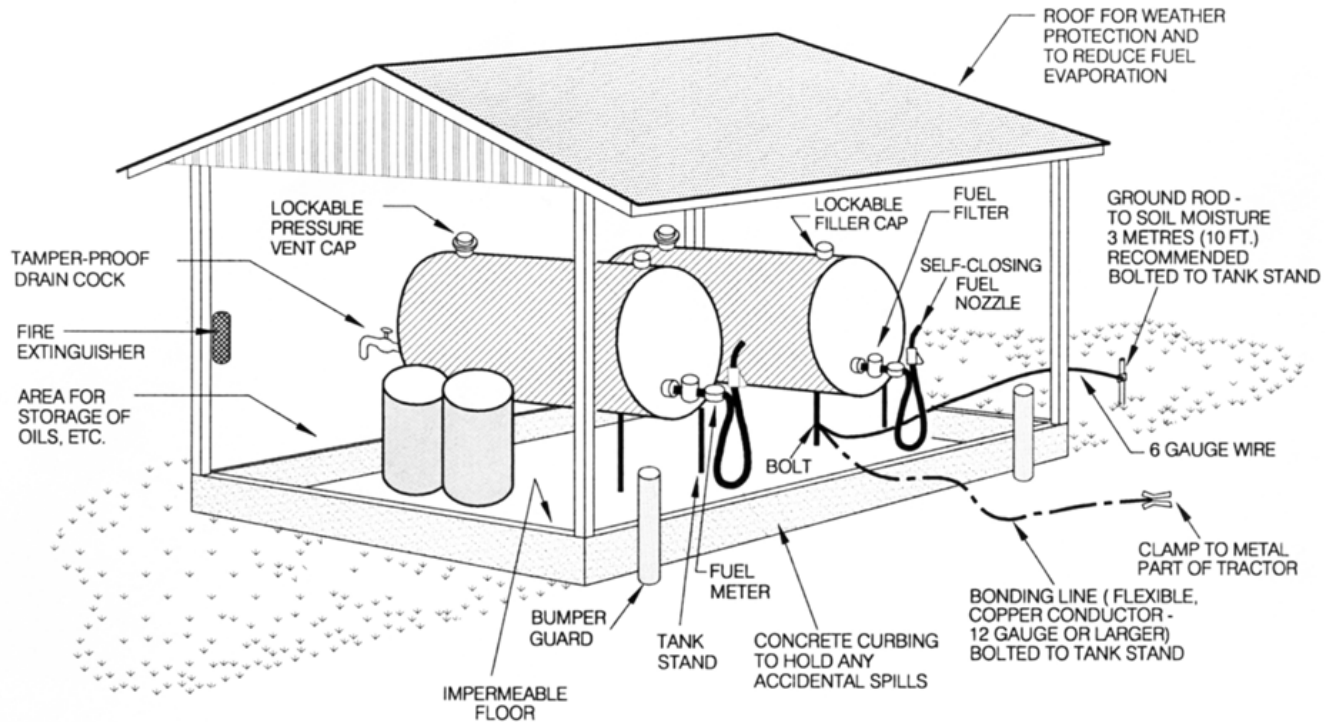
- A minimum of 9kg foam extinguishers or 2 dry chemical powder for each store

Maintenance of fire Extinguishers

- All fire extinguishers to be examined once a year
- All fire extinguishers to be discharged and refilled once every year.



Aboveground Storage Tanks



Aboveground Storage Tanks

Evaporation Losses

Tank Colour	Exposure	Pressure vent cap	Evaporation Loss	Percentage Loss
Dark Tank	In Sun		38 litres	3.2%
Light Tank	In Sun		23 litres	1.9%
Dark Tank	In Sun	Pa vent cap	21 litres	1.8%
Light Tank	In Sun	Pa vent cap	9 litres	0.8%
Dark Tank	In Shade		9 litres	0.8%
Light Tank	In Shade	Pa vent cap	5 litres	0.4%



Aboveground Storage Tanks

Siting

- All tanks containing >200 litres shall be situated 9m away from any building or boundary

Construction

- **General**-tanks to comply with approved ZWS 783:2005
- **Ullage**- tanks to have sufficient ullage to permit free expansion of the liquid when filled to rated capacity
- **Earthing connections** – positive earthing connections to be provided where maximum resistance to earth is more than 7Ω
- **Manholes** – where provided they should be big enough to allow a man to enter and leave the tank when wearing full PPE – 600mm
- **Painting**-all tanks of corrodible material to be painted externally with ant-corrosive paint
- All tanks to be provided with an approved **bund**



Aboveground Storage Tanks

Tank Connections

- Connections and fittings to tank shell or bottom of tank to be done by qualified tradesman
- Filling connections shall be taken to the bottom of the tank
- Valves and Pumps
 - A mark shall clearly show whether a valve is open or closed.
 - Non return valves shall be provided where necessary
 - Valves should be easily repacked under pressure where necessary
- Filters shall be inspected and cleaned regularly
- Hoses shall be of suitable material and correct rating
- Static bonding – to afford electrical continuity between couplings
- Ventilation Openings
 - To permit pressure or vacuum release during operation
 - Vents should regularly be inspected for effective operation



Aboveground Storage Tanks

Safety Precautions

- Naked Lights and Electrical Apparatus
 - The words “**NO SMOKING-NO NAKED LIGHTS**” in block letters size 100mm x 50mm to be shown
 - No fire, flame, naked light or any sources of ignition (except electric light enclosed in a flame proof fitting) shall be allowed within 9m of a storage tank vent
 - No electric switch, fuse, motor or such device is allowed within 9m of a storage tank unless it is flame proof



Aboveground Storage Tanks

Entering Storage Tanks

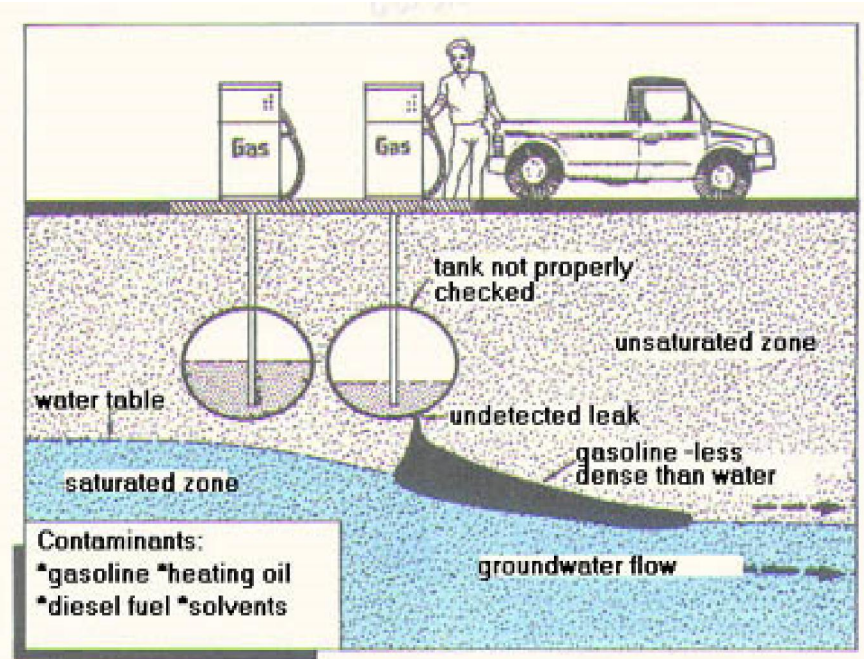
- Do not enter tanks which have contained fuels without correct PPE
- No person shall enter a storage tank without being attached to a life line controlled by a reliable person outside

Firebreaks

- Long grass shall not be allowed within 10m radius of a tank



Underground Storage Tanks



Underground Storage Tanks

Capacity -no individual tank shall exceed 37 000 litres

Siting

- Tanks to be at least 3m away from buildings.
- Tanks shall be at least 600mm lower than any floor, basement, cellar or pit in any building nearer than 3m from the tank

Proximity to other tanks – at least 300mm

Filler points

- Filler points to allow filling from delivery trucks without the truck disturbing free public movement
- Filler points can be direct or remote



Underground Storage Tanks

Construction

- **Material and workmanship** to be approved
- **Pressure tests** to be done at the manufacturers factory
- **Approval Plate** – to be affixed to each tank at an easily accessible position showing
 - Manufacturers name, date of manufacture and tank capacity
- **Painting and Protection** – the exterior of the tank to be protected against corrosion with a suitable material
 - secondary containment of all tanks and piping (e.g., double wall)
 - leak detection, observation wells
 - an overfill protection device for the tank
 - a spill containment device at the fill nozzle



Underground Storage Tanks

Installation

- Excavation – Tank to be completely buried at least 600mm underground
- Tank Covering – tank to be covered by 150mm layer of sweet sand firmly and thoroughly compacted
- Manholes – covers not to allow water ingress and to resist vehicular traffic
- Tanks to be strapped to counter buoyancy



Underground Storage Tank

Connections to Tank

- Pressure test – all connecting pipes to be pressure tested on installation (34.5kpa for 30min)
- Limitation –no tank shall have more than 1 filler point, one vent pipe and one dip pipe.
- Depth of fill pipes- shall be carried down to within 75mm of tank bottom
- Vent pipes- to at least 5m and not to vent into adjacent premises
- Dip sticks – to be made of wood or aluminium only and visibly marked



Underground Storage Tank

Abandoning Tanks

- Owner has the responsibility of removing abandoned tank
- All openings to be securely sealed prior to removal
- Otherwise fill tank with sand or liquid concrete
- Removed tank must be degassed and cleaned to avoid poisoning, asphyxiation or explosion
- The seller of a removed tank must issue the buyer with an indemnity certificate



Portable Containers

- **Construction** - No flammable liquid fuel exceeding 50litres shall be stored or carried in one container unless the container is constructed of metal not less than 1.00mm in thickness
- **Filling of Containers** – to fill in a permitted open space or approved well ventilated fire resistant building
- **Ullage** – No container shall be filled to more than 95% of its capacity
- Containers to filled whilst placed on the ground, to held or at the back of a car



Portable Containers

Storage of empty containers

- Empty containers shall not be placed anywhere other than in a flammable liquid store
- Empty containers shall not be left in any public place
- Every empty container shall at all times be securely closed with a bung, or suitable stopper except when in use or under repairs



Portable Containers

Repairing of containers

- Empty container of liquid
- Degas container
- Use skilled workman



Pipelines

Siting

- Corrosion - Buried lines shall be protected against corrosion
- Fire Stops – Pipes in open trenches shall be provided with fire stops at regular intervals
- Pipelines under Thoroughfares – pipes not to pass under railroads, roadways etc. unless suitably sleeved or protected against damage
- Pipes Over Thoroughfares – not allowed unless adequate and safe access is provided
- Marking of Route – Route of underground pipe to be suitably indicated.
- Safety drawings showing position of lines and location of control valves and fittings shall be kept



Pipelines

Construction

- To comply with approved standards

Installation

- Expansion allowance – to allow for pipelines expansion and contraction and for tank settlement
- Flexible connections – except for UST, must be provided between tanks and pipelines
- Pressure test – Pipelines to be hydraulically pressure tested before burial and commission
- Identification – Should be suitably colour coded
- Stays, Guy Ropes and tackles not to be attached to pipelines



LPGas ZWS 960:2012



LPGas Safety Precautions

Cylinder installations

- Installation by a certified installer
- Fixed, secured in a vertical position
- Keep cylinders away from sources of ignition
- Keep cylinder location well ventilated
- Have a maintenance contract with gas supplier
- Have clear operating instructions and emergency procedures on site
- Have correct signage in conspicuous positions



LPGas Safety Precautions

Bulk Tanks

- Certified installer - ZWS 960
- Keep combustible material away
- Don't use chlorate based weed killers as they can be fire hazards
- Tanks to be secured against trespassers
- Have adequate maintenance arrangements in place
- Keep sources of ignition away from tanks
- Have correct and adequate signage in place



LPGas Safety Precautions

Emergency Action

- Call the fire brigade. Tell them LPG cylinders are on the premises.
- Activate fire alarm and evacuate premises
- If it is safe to do so, turn off all LPG appliances.
- If you think that you have an LPG leak, or that an LPG appliance is not working properly,
 - call the LPG supplier so that they can come and make safe.
- If the leak is indoors, open all doors and windows.
- Do not switch any lights or electrical equipment on or off, as this may cause a spark.



Thank you

