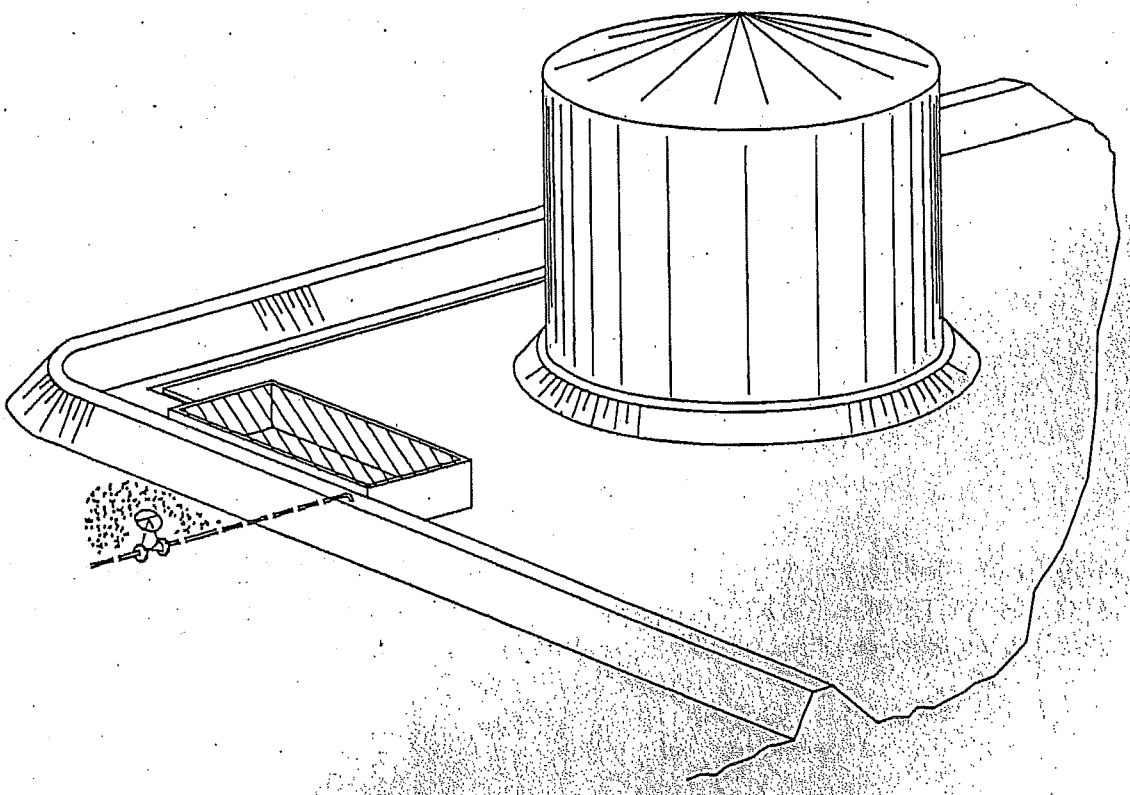
Above-ground Bulk Tank Containment Systems

Environmental Guidelines for the Petroleum Marketing Companies



MINISTRY FOR THE ENVIRONMENT
MANATŪ MŌ TE TAIAO

Prepared by a Joint Working Group of the Ministry for the Environment, the Department of Labour, local authorities and petroleum marketing companies.

Environmental Guidelines for Petroleum Marketing Companies

Above-ground Bulk Tank Containment Systems

A Guideline

This guideline is one of a series making up the Environmental Guidelines for Petroleum Marketing Companies. It was prepared by a joint working group of the Ministry for the Environment, the Department of Labour, local authorities and petroleum marketing companies.

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Contents

Above-ground Bulk Tank Containment Systems

A Guideline

1. Objective

This guideline has been prepared as a statement both of policy and of specific design and management measures, to ensure the effective retention of petroleum products in above-ground bulk storage tank containment systems and with special regard for the protection for people, property, and the environment.

This guideline is intended to be read in conjunction with, and to complement, the Dangerous Goods Act 1974 (Dangerous Goods Act), the Dangerous Goods Regulations (Dangerous Goods Regulations) and the Resource Management Act 1991 (RM Act). It does not replace or supersede the requirements of these Acts or Regulations but provides guidance on how their requirements can be met. This guideline does not fully take into account requirements of the pending Hazardous Substances and New Organisms (HSNO) legislation. It is therefore acknowledged that this guideline is a transitional document, and it may require amendment once the HSNO Bill and Regulations are brought into force. Such an amendment will be made within two years of the date of the release of HSNO Regulations.

This guideline is not intended to be used as a technical specification. It must be supported by detailed technical documentation to obtain approval for any project work from a consent granting or permitting authority.

This guideline has been jointly prepared by:

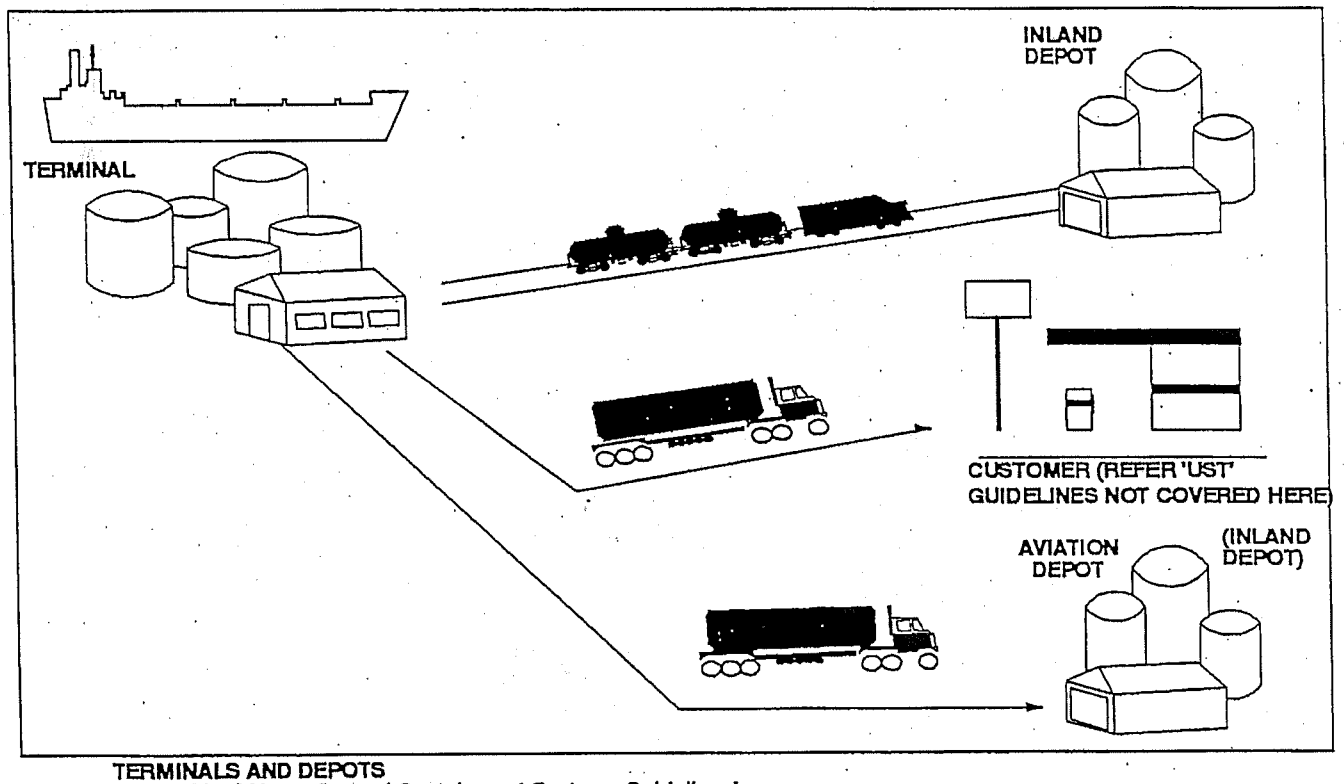
Auckland Regional Council	)	on behalf of the sixteen
Canterbury Regional Council	)	regional councils and unitary
Environment Waikato	)	authorities
Taranaki Regional Council	)	
Wellington Regional Council	)	
Department of Labour Explosives and Dangerous Goods Division		
Ministry for the Environment		
Territorial Local Authorities		
BP Oil New Zealand Limited	)	on behalf of petroleum
Caltex Oil (N.Z.) Limited	)	marketing companies
Mobil Oil New Zealand Limited	)	
Shell New Zealand Limited	)	

2. Scope

All above-ground (or partially depressed) bulk storage tank containment systems, which were initially developed prior to 1965, should be either progressively upgraded or replaced over a period of time.

This guideline applies to above-ground (or partially depressed) bulk storage tank containment systems owned by the petroleum marketing companies at port facilities, inland depots and airports. While it is recognised that there are non-hydrocarbons stored at some localities, this guideline has been developed for containment of hydrocarbons such as fuels and bitumen.

This guideline is not intended to be applied to customer above-ground facilities. These will be covered separately.

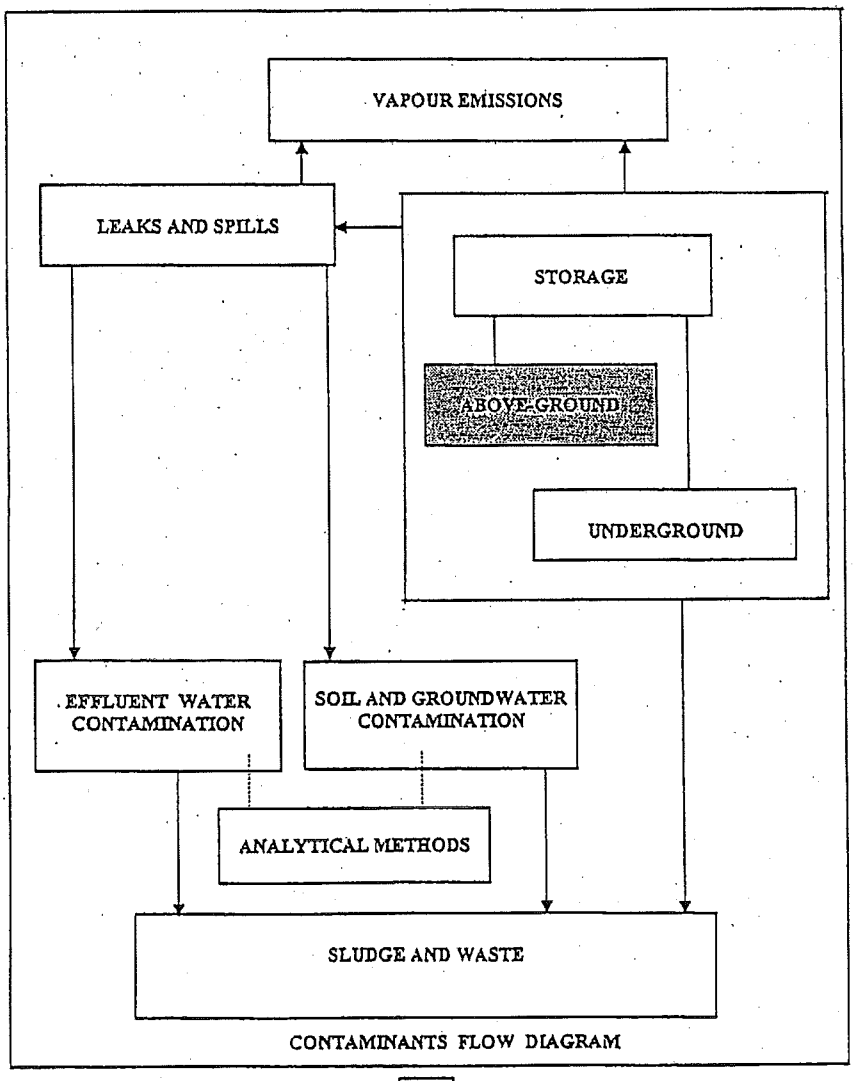


TERMINALS AND DEPOTS
covered by 'Above Ground Containment Systems Guidelines'.

Other environmental management codes of practice or guidelines published or in the process of development by Ministry for the Environment, Department of Labour, local authorities and the petroleum marketing companies:

- Design, Installation and Operation of Underground Petroleum Storage Systems - published 1992.
- Management of Existing Underground Petroleum Systems - published May 1995.
- Transportation and Disposal of Petroleum Storage Tanks and Related Wastes - published May 1995.
- Surface Water Discharge Quality - to be published.
- Assessment and Management of Petroleum Hydrocarbons Contaminated Sites - to be published.
- Analytical Methods for Determining Petroleum Products in Soil and Water - to be published.
- Vapour Emissions and Air Quality - to be published.

Environmental Guidelines for Petroleum Marketing Companies



3. Definitions

AGCS	An above-ground (or partially depressed) bulk storage tank(s) containment system.
ANZECC	Australian and New Zealand Environment and Conservation Council.
Claymax	A bentonite membrane encapsulated by a geotextile (i.e. cloth or mesh).
Compound	Bunded areas surrounding above-ground (or partially depressed) bulk storage tanks. Also referred to as a "dyke" or bund.
Containment systems	(a) Systems for the containment of spills from aboveground (or partially depressed) bulk storage tanks, being a primary containment system (compound) which envelops the entire aboveground (or partially depressed) bulk storage tanks; and (b) a secondary containment system of an additional low permeability barrier introduced below the base of each tank.
DOL	Department of Labour (usually OSH in this situation).
Energy environments	(a) Low - limited mixing of discharged liquid contaminants, e.g. a shallow harbour or a stream which has a low rate of exchange. (b) Medium - moderate amount of mixing of discharged liquid contaminants, e.g. most deep water harbours, sheltered ocean bays and rivers. (c) High - considerable amount of mixing of discharged liquid contaminants, e.g. some deep water harbours and unsheltered coastlines.
HDPE	High density polyethylene.
HDT	HDPE, but with a non-skid surface to enable secure bonding of HDPE to granular materials.
Petroleum marketing companies	Divisions of companies responsible for handling and storage of refined petroleum products.
Receiving waters	Natural waters such as streams, ponds, lakes, rivers, ground water, harbours or the sea.
RM Act	The Resource Management Act 1991 and all amendments.
Zones	Defined environment geographic locations where adverse effects have a potential to occur. (Refer section 9 (c)).

4. Design

Prior to upgrading existing or building new AGCS, technical and operability studies shall be undertaken to assess the actual or potential effects of these facilities on the surrounding environment.

Factors which should be taken into account when designing containment systems include the following:

- proximity to, and environmental sensitivity of surface waters,
- proximity to, and environmental sensitivity of ground water,
- nature and volume of products stored,
- resistance of containment materials to the product stored,
- service loadings on containment media,
- provision for secondary containment under tanks,
- seismic and climatic considerations,
- interfacing of the various structural elements within the compound,
- leak detection devices,
- overfill protection devices,
- provision for the management of fire control water, and
- location of utility services

The design of new/upgraded AGCS shall be verified by full post-construction integrity testing. The results, where requested, will be made available to the relevant authority.

5. Description of typical facility environments

(a) Location

Taking into account the volumes of product stored and the means of supply, together with the nature of the receiving water environments, there are three convenient generic location groups which may be identified as follows:

(i) Refinery supplied storage facilities

(Volume stored: typically 5-50 million litres per any one tank complex). Apart from the pipeline supplied state-of-the-art Wiri Oil Terminal, these facilities are supplied ex marine tankers ("tankships"). They are generally located on low gradient reclaimed land in close proximity to deep water ports having medium to high energy receiving water environments. Groundwater is normally shallow, often tidally influenced, not considered a usable resource and is divorced from usable groundwater resources.

(ii) International airport facilities

(Volume stored: Typically from 0.5-5 million litres in any one tank complex).
Auckland Airport facilities and Christchurch Airport facilities are both close to sensitive receiving water environments. In addition, Wellington Airport facilities are located on a low altitude isthmus, adjacent to receiving waters which are medium to high energy marine environments.

(iii) Domestic airport facilities and inland depots

(Volume stored: typically 50,000 - 1.5million litres).

These are located adjacent to receiving surface and ground water environments, which have varying degrees of sensitivity.

6. Properties of principal products stored

(a) Key physical properties

The following properties of the principal products stored are considered to be most relevant to the rate of product release. Water is also shown for comparison.

	DG Class	Density (kg/litre)	Kinematic Viscosity @ 15°C (centistokes (CS)
Gasolines	3A	0.7 - 0.79	1
Kerosines	3B	0.77 - 0.84	2
Diesels	3C	0.80 - 0.90	15-30
Lubricating oils	-	0.85 - 0.9	100-10,000
Light fuel oils	3C	0.90 - 0.95	100
Heavy fuel oils	3C	0.95 - 1.00	1200
Bitumen	-	1.00 - 1.05	1000 +
Water	-	1.00	1.5

(b) Additional properties

Further properties are summarised in the material safety data sheets in Appendix B of this document.

7. Containment requirements

Containment requirements in the past have been limited to those expressed in Dangerous Goods (Class 3 - Flammable Liquids) Regulations 1985 which have required compounding with "impervious" incombustible materials, such as concrete, brick, clay, clean binding earth or "such other materials deemed adequate by an inspector". The Regulations require that the compound "contains" (released) dangerous goods. The intention of "containment" is that if a spill occurs the permeability of the compound floor and walls will be sufficient to retain that spill (either above or within the containment media) until such time as the spill can be retrieved.

Consideration must also be given to the provisions of the Resource Management Act 1991 which prohibit the discharge of contaminants unless allowed for by a rule in a regional plan or in any relevant proposed regional plan, a resource consent, or regulations. Releases into surface water runoff systems will also need to comply with Oil Industry Guideline No 3 on Effluent Water Contamination and local authority requirements.

8. Means of achieving satisfactory containment standards

(a) Materials to be used in compound construction

Materials used in compound construction should include low permeability devices such as:

- natural materials such as clay or compacted basecourse,
- geomembranes e.g. composite bentonite geotextile/HDPE/etc,
- reinforced concrete (generally for small systems),
- impermeable cutoff walls (similar to sheet piling) or any proven new technologies;

or a combination of these - for typical examples, refer Appendix A.

(b) Determination of barrier thickness

Barrier thickness shall be sufficient to restrict the water seepage rate, while under full hydrostatic test, to not more than 1mm/hour. Seepage rate may be calculated from the Darcy equation as follows:

Where $v = k \times i$
v = seepage rate
k = coefficient of permeability
i = hydraulic gradient = z/l,
where z = hydrostatic head
$= p \times h$,
where p = liquid density
and h = differential height, (refer Appendix A1)
and l = barrier thickness

In setting the seepage rate relative to water to 1mm/hr and ensuring that the coefficient of water permeability is not more than 1×10^{-7} m/sec (based on International Oil Company guidelines), "safe and efficient containment of (low viscosity) products should they be released" is expected. Refer to Appendix A for an example of a calculation of seepage through a clay barrier. Note well that to achieve the requisite seepage rate, thin barriers such as HDPE need to have lower permeabilities than clay barriers.

Where there is a certainty that there will never be a requirement to contain low viscosity products, more permeable and/or thinner barriers appropriate for the least viscous product shall be allowed. However, should there be a need to change from storage of high viscosity product storage to low viscosity product storage, the containment system shall be redesigned and reconstructed if it is no longer appropriate.

9. Containment volume

The minimum volume to be contained within the compound shall be determined through:

(a) Dangerous goods considerations

As per Dangerous Goods (Class 3 Flammable Liquids) Regulations 1985 which state that "every above-ground tank shall be compounded, and every compound shall be of sufficient

capacity to contain the full volume of the dangerous goods capable of being held by the largest tank in the compound, provided that, where any compound is reserved for the storage of dangerous goods of Class 3(c) only, an inspector may, after taking into account such matters as product viscosity, isolation from "protected works" and natural waters, and any other relevant matter, approve a compound having half the volume of the largest tank in the compound".

(b) Environmental and other considerations

Dependant on product viscosity and proximity of facilities to environmentally sensitive surface and ground waters.

The following matrix takes into account the D.G. Regs, considers the influence of viscosity and, to a degree, toxicity on potential impact (refer also, Appendix pages A2, A2.1, and A2.2) and provides an additional containment volume matrix for non-dangerous goods:

Percentage Minimum (Containment Volume Relative to the Largest Tank Capacity)

Product Classification (3A, 3B, 3C are 'Dangerous Goods' Classifications)	Environmental Zones A & B & Coastal Waters	Environmental Zone C
3A	[1]100	[1]100
3B	[1]100	[1]100
3C	[2]100	[2]100
ND - low viscosity	[3]100	[3]25
ND - med viscosity	[3]50	[3]10
ND - high viscosity	[3]0	[3]0

Key

N.D.	: Non-dangerous goods
1	: Requirements of D.G. Regulations
2	: D.G. Regs have provision for the approval of lower containment volumes for 3C products (Refer preceding 9 (a))
3	: Environmental and other considerations govern
Low viscosity	: 0-100) Kinematic viscosity
Medium viscosity	: 101-500) (in centistokes)
High viscosity	: >500) at 15°C

Comments

(i) Highly viscous products although pourable when heated, if released will cease to flow as they cool in the ambient conditions.

(ii) Although containment is not mandatory for ND-high viscosity products, management plans must be developed to avoid, mitigate and remedy the effects of a release, should it occur from these facilities.

(iii) Toxicity, particularly ecotoxicity, is also a consideration for low viscosity products.
The "100% containment volume relative to the largest tank capacity" requirement for low viscosity products stored adjacent to the more sensitive environmental zones makes provision for this.

(c) Sensitivity classifications from UPSS Code of Practice

Three environmental sensitivity zones are recognised by the DOL (OSH) "Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems (UPSS)". It is appropriate to use these zones in respect of AGCS. These zones are:

"Zone A Highly Sensitive Areas are areas where there is a high risk that any leakage from an (AGCS) will contaminate an aquifer which is used or has been identified for future use as a source of supply for a reticulated potable water system.

Zone B Moderately Sensitive Areas are areas that are within 100 metres (or such greater distance that the Authority shows is needed) of any pumping station drawing potable water from an underground source, or of areas such as inland waterways and wetlands where any leakage from an AGCS will have a medium or long term adverse effect on that environment, as determined in consultation with the appropriate Authority.

Zone C Other Areas of Lesser Sensitivity where any leakage from an AGCS is unlikely to pose a significant threat to human life or to the environment."

10. Management controls associated with AGCS

10.1 In-service integrity testing

(a) Storage tanks shall be managed in accordance with the "Guide for the Inspection, Repair, Alteration and Reconstruction of Above-Ground Bulk Storage Tanks", a joint petroleum marketing companies/DOL document.

(b) AGCS shall be subjected to permeability testing at least once every year by retaining water accumulated within the compound following rainfall events and visually observing the rate of seepage. Also, at least once every 10 years compounds shall be flooded to the level of the floor of the lowest tank and the seepage rate physically measured. Compounds constructed in the post-1965 era which fail to meet the permeability standard shall be remediated promptly, within practical limitations. (See also section 3).

(c) Releases of waters used for testing of storage tanks and bulk compounds shall be managed in accordance with the Oil Industry Guideline No 3 and local authority requirements.

(d) Facilities shall be visually checked daily to ensure that no products have been or are being accidentally released.

10.2 Product degradation of containment materials

Containment materials, which have been contaminated by a product release shall be removed and the original design and construction standard reinstated. Remediation should be carried out in accordance with Oil Industry Guideline No 5.

10.3 Operator training

Every AGCS shall be managed by experienced personnel and delegated tasks shall be undertaken by trained operators who have been made fully aware of their responsibilities under these guidelines and obligations under the RM Act and the Dangerous Goods Act.

10.4 Inventory control

The facilities manager shall set up and maintain an inventory control system which shall include regular routine reconciliations of quantities of product movements and stock-on-hand, with regular reviews of cumulative variances. The time period at which reconciliations will be carried out will be appropriate to the product types and associated risks. Any departure from the established pattern of stock variation peculiar to the storage facility must be immediately investigated. See also, Appendix A9.

10.5 Emergency procedures

To enable response to any emergency that may arise, including possible spills, leaks, fire and explosion, an appropriate plan shall be in place. It is the responsibility of management personnel to retain a plan copy on site. Emergency procedures shall be tested by way of emergency exercises at least once per year. Refer also to Appendix A10.

10.6 Requirements for unattended AGCS

To ensure that no products are being accidentally released and that there has been no breach of security, tank compound drain valves shall be maintained in the closed position except while water is being released from the compound. Unattended facilities shall be subjected to physical integrity inspections, and/or remote electronic surveillance, daily.

10.7 Audits

Every AGCS shall be subjected to regular (at maximum intervals of four years) technical audits by competent oil company and/or independant audit teams to ensure that the objectives of this guideline have been met. Technical audits shall take into account such items as evidence of assurance as to the degree of permeability of the containment materials, the condition of the facilities, fitness for purpose, status of containment system outlet valves, the extent of contamination present, the height of compound walls and the products which are currently being stored.

Appendices

A. Containment Solutions, Calculations and Procedures

A1	Relationship between Seepage and Permeability
A2	Formulae for Calculating Time Required to Empty a Vessel
A2.1	Tabulation of Losses from Tanks (through stubpipes)
A2.2	Rate of Product Release over Time from Tank
A3	Example of Earth Foundation
A4	Examples of Earth Bund Walls
A5	Examples of Concrete Bund Walls
A6	Impermeable Cutoff Wall
A7	Stock Reconciliation
A8	Response to Product Release

B. Material Safety Data Sheets

B1	Fuel: Avgas 100
B2	Fuel: Unleaded Gasoline, Not Oxygenated
B3	Fuel: Leaded Gasoline, Not Oxygenated
B4	Fuel: Automotive Gas Oil
B5	Fuel: Domestic Kerosine
B6	Fuel: Industrial Light Fuel Oil
B7	Fuel: Industrial Heavy Fuel Oil
B8	Bitumen: Cut Back Grade

Appendix A1

RELATIONSHIP BETWEEN SEEPAGE AND PERMEABILITY

From Darcy equation,

seepage, $v = k \times i$

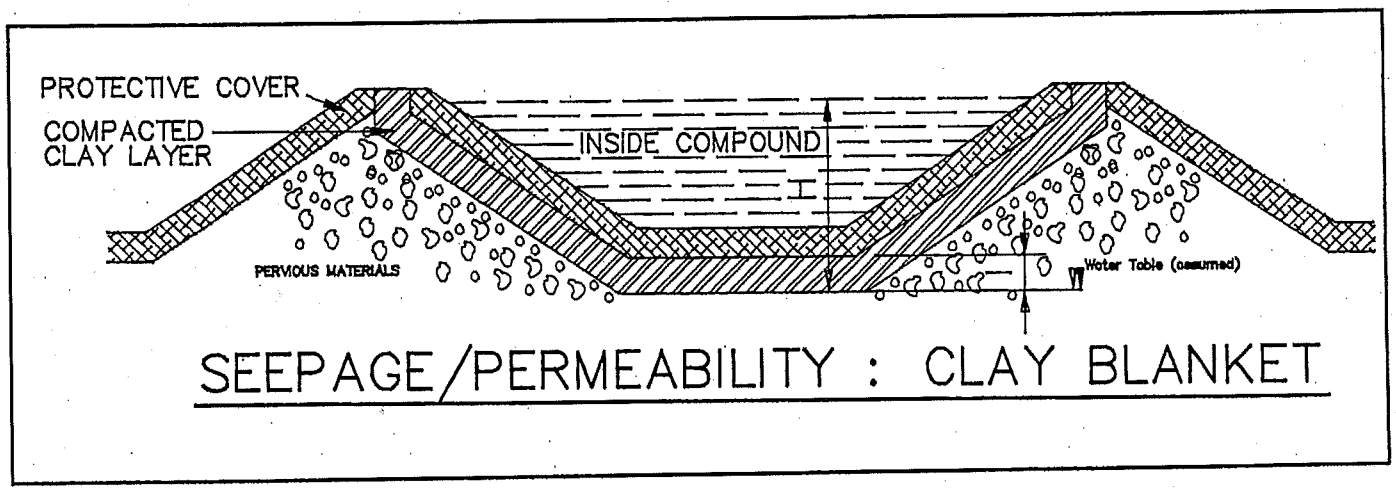
where k = coefficient of permeability,

i = hydraulic gradient = z/l,

l = barrier thickness,

z = hydrostatic head = p x h,

p = liquid density and h = height shown below.



SEEPAGE/PERMEABILITY : CLAY BLANKET

EXAMPLE:

(a) assume barrier('clay')permeability coefficient of 0.0001 mm/sec(1 x E-7 m/s)

(b) calculate seepage for compounded water(density = 1 kg/litre)

l(thickness)		z(head)		v(seepage)
250	mm	500	mm	0.72 mm/hr
250	mm	750	mm	1.08 mm/hr
250	mm	1000	mm	1.44 mm/hr
250	mm	1250	mm	1.80 mm/hr
250	mm	1500	mm	2.16 mm/hr
300	mm	500	mm	0.60 mm/hr
300	mm	750	mm	0.90 mm/hr
300	mm	1000	mm	1.20 mm/hr
300	mm	1250	mm	1.50 mm/hr
300	mm	1500	mm	1.80 mm/hr
350	mm	500	mm	0.51 mm/hr
350	mm	750	mm	0.77 mm/hr
350	mm	1000	mm	1.03 mm/hr
350	mm	1250	mm	1.29 mm/hr
350	mm	1500	mm	1.54 mm/hr

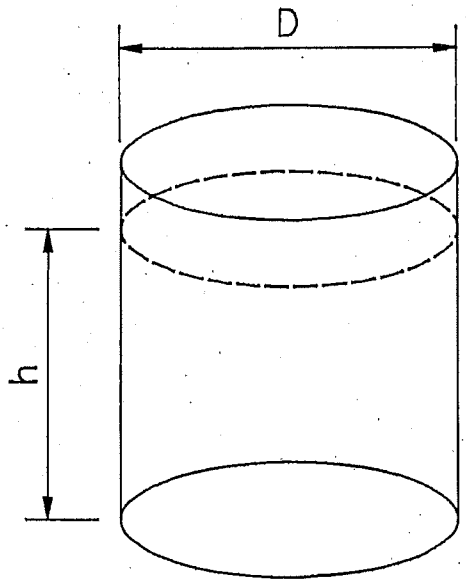
Conclusion:

(i)Required barrier thickness to achieve seepage criterion increases in direct proportion to hydrostatic head requirement.

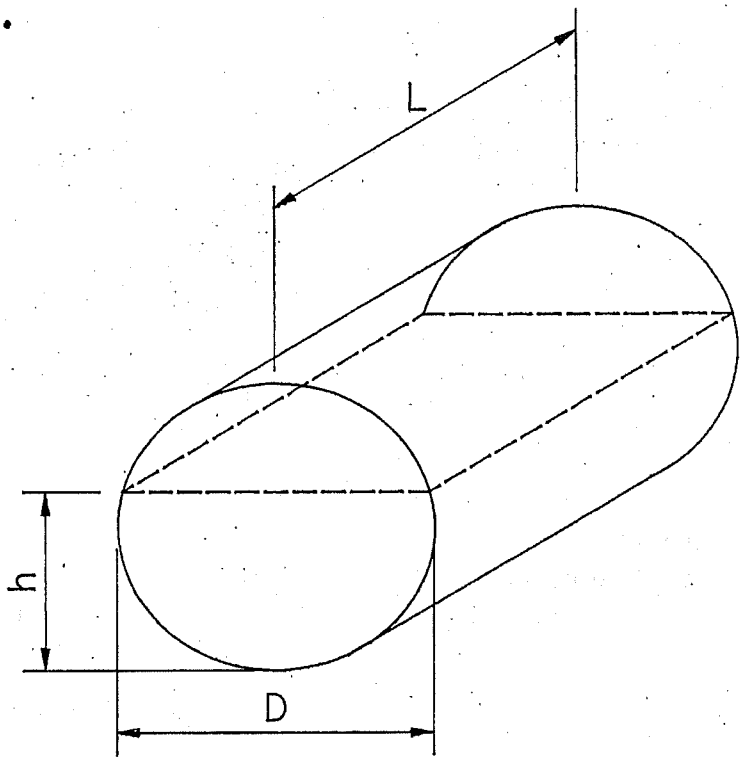
(ii)48 hours following product loss,low viscosity products would still be retained near the surface of the clay barrier enabling product to be recovered e.g. by flooding with water and skimming from surface.

RATE OF PRODUCT RELEASE FROM STORAGE TANK.

FORMULAE FOR CALCULATING TIME REQUIRED TO EMPTY A VESSEL.



VERTICAL CYLINDER.



HORIZONTAL CYLINDER.

$$t = \frac{\pi D^2 \sqrt{h}}{\sqrt{8}\, C_d A_n \sqrt{g}}$$

$$t = \frac{\sqrt{8}\, L \left(D^{3/2} - (D-h)^{3/2}\right)}{3 C_d A_n \sqrt{g}}$$

A_n = orifice area, m^2.
g = 9.81 m/s^2.
t = time to empty. S.

C_d = 0.61 for sharp-edged orifice.
C_d = 0.80 for short, flush-mounted tube.
C_d = 0.98 for rounded orifice.

The figure shows how to calculate the time required to empty a vessel, for two common tank geometries. The discharge coefficient (C_d) is constant for Newtonian fluids in turbulent flow, but it depends on the shape of the orifice. Water flowing through sharp-edged orifices 6mm diameter or larger is always turbulent- thus the assumption of constant C_d is valid for most practical applications. The figure lists accepted C_d values.

Appendix A2.1

TABULATION OF LOSSES FROM TANKS THROUGH STUB PIPES

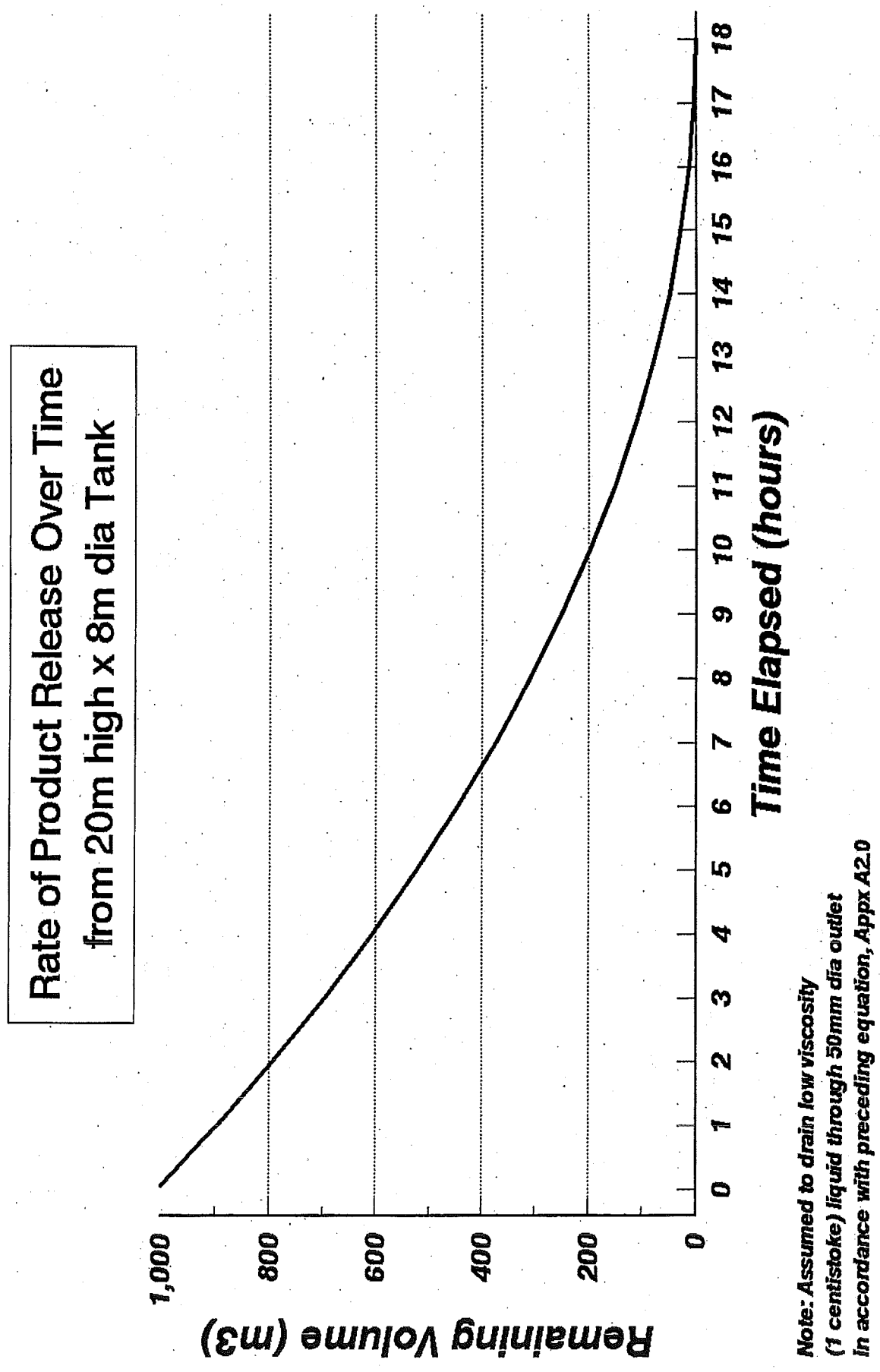
TABLE 1; Time to drain water(viscosity = 1 centistoke,density = 1 kg/litre)
(Using formula on preceding page,assuming a vertical cylindrical tank having a diameter of 8 metres)

DEPTH (metres)	DISCHARGE (litre/min)	DRAIN TIME (hrs)	ACCUMULATED TIME(hrs)	INCREMENTAL TIME(hrs)	REMAINS (cub.metres)
20.00	1821.95	17.95	0.00	0.00	1005.71
19.50	1821.95	17.72	0.23	0.23	980.57
19.00	1821.95	17.49	0.46	0.23	955.43
18.50	1821.95	17.26	0.69	0.23	930.29
18.00	1746.03	17.02	0.93	0.24	905.14
17.00	1783.18	16.55	1.40	0.47	854.86
16.00	1676.19	16.05	1.90	0.50	804.57
14.00	1611.72	15.01	2.94	1.04	704.00
12.00	1510.08	13.90	4.05	1.11	603.43
10.00	1385.28	12.69	5.26	1.21	502.86
8.00	1250.89	11.35	6.60	1.34	402.29
6.00	1102.76	9.83	8.12	1.52	301.71
5.00	974.53	8.97	8.98	0.86	251.43
4.00	891.59	8.03	9.92	0.94	201.14
3.00	776.01	6.95	11.00	1.08	150.86
2.00	654.76	5.67	12.28	1.28	100.57
1.50	558.73	4.92	13.03	0.75	75.43
1.00	460.49	4.01	13.94	0.91	50.29
0.75	395.33	3.48	14.47	0.53	37.71
0.50	327.38	2.84	15.11	0.64	25.14
0.25	252.44	2.01	15.94	0.83	12.57
0.10	169.88	1.27	16.68	0.74	5.03
0.00	65.99	0.00	17.95	1.27	0.00

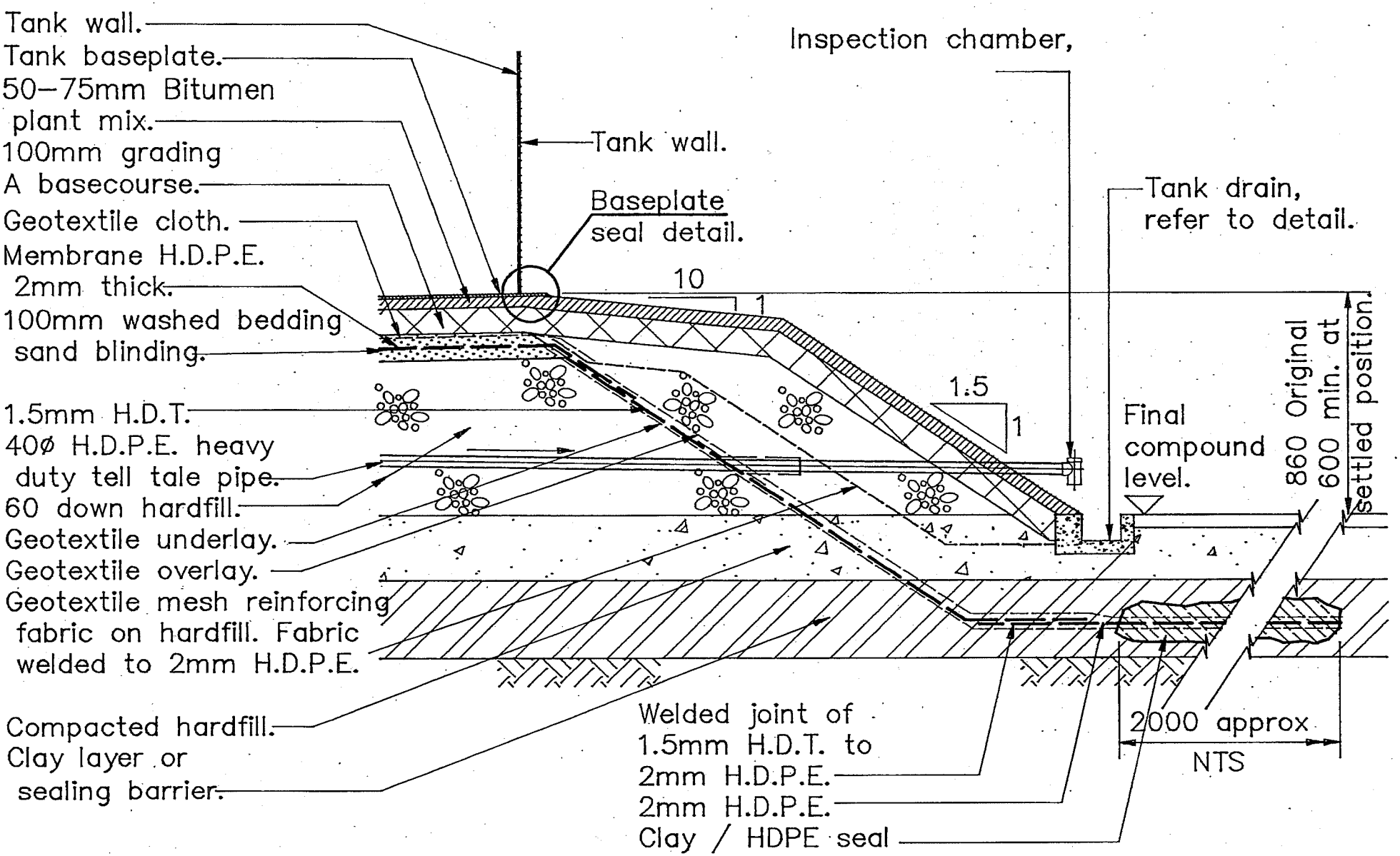
TABLE 2: Time to drain for more viscous products(assume density = 1 kg/l)

VISCOSITY (centistokes)	TANK DIAMETER (metres)	PRODUCT DEPTH (metres)	TIME TO DRAIN (approximate hours)
1.0	8	20	18
1.0	16	20	72
100	8	20	29
100	16	20	117
500	8	20	103
500	16	20	410
1000	8	20	226
1000	16	20	904
5000	8	20	1026
5000	16	20	4106

NOTE: Table 2 has been developed by applying traditional head loss/flow calculations to the 'orifice' model used to develop Table 1, above.

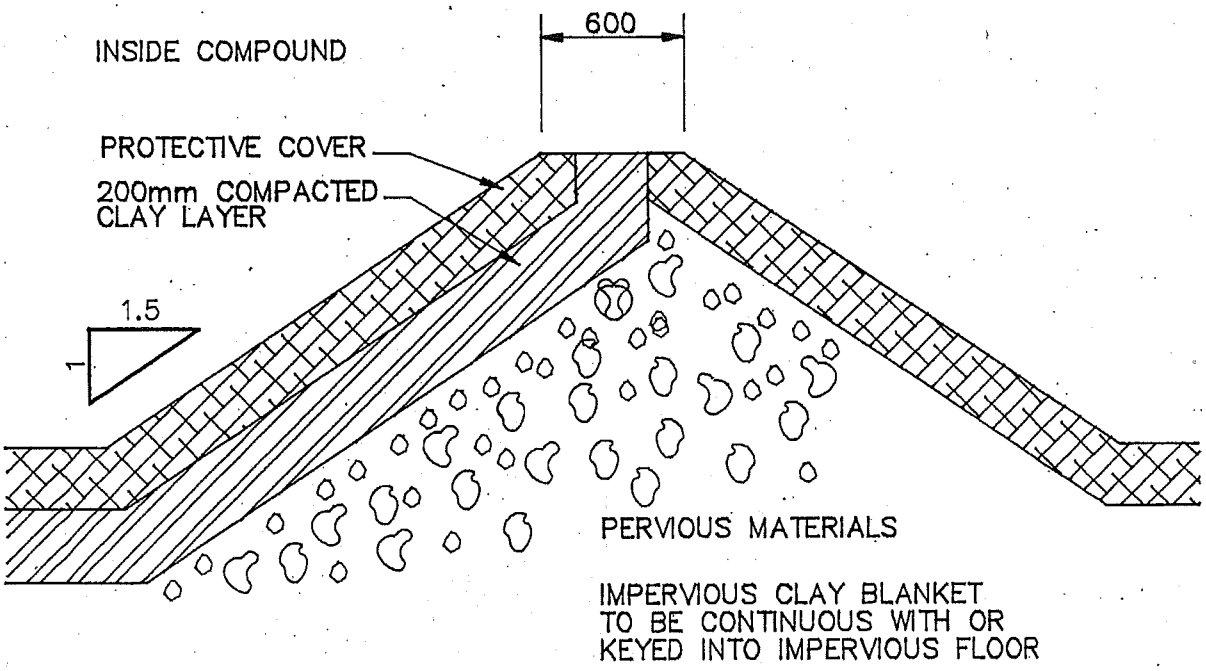


Note: Assumed to drain low viscosity
(1 centistoke) liquid through 50mm dia outlet
In accordance with preceding equation, Appx A2.0

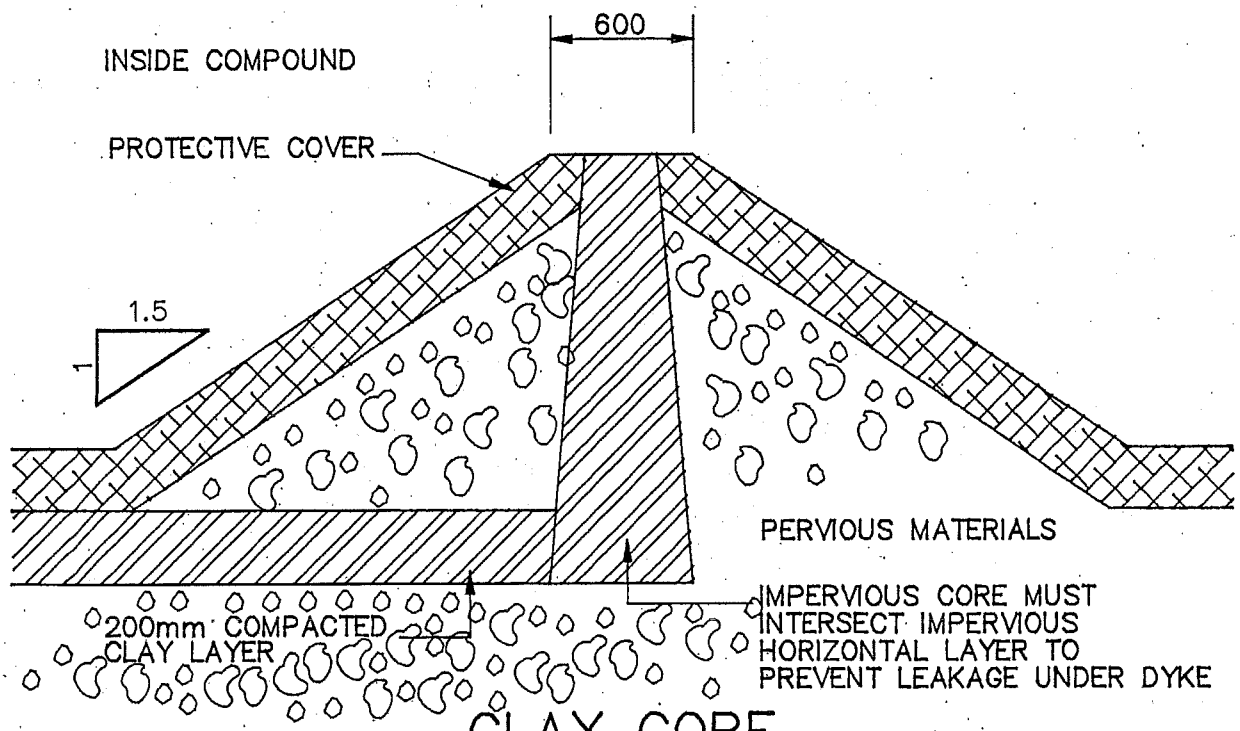


EXAMPLE OF EARTH FOUNDATION – DETAIL 1.

Appendix A4

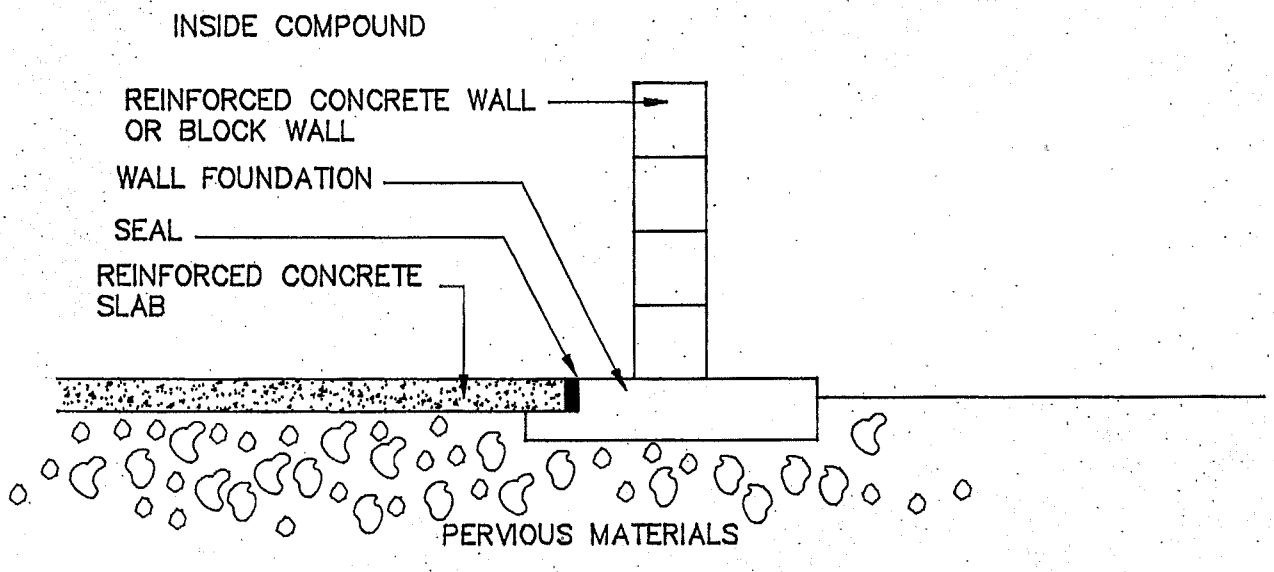


CLAY BLANKET

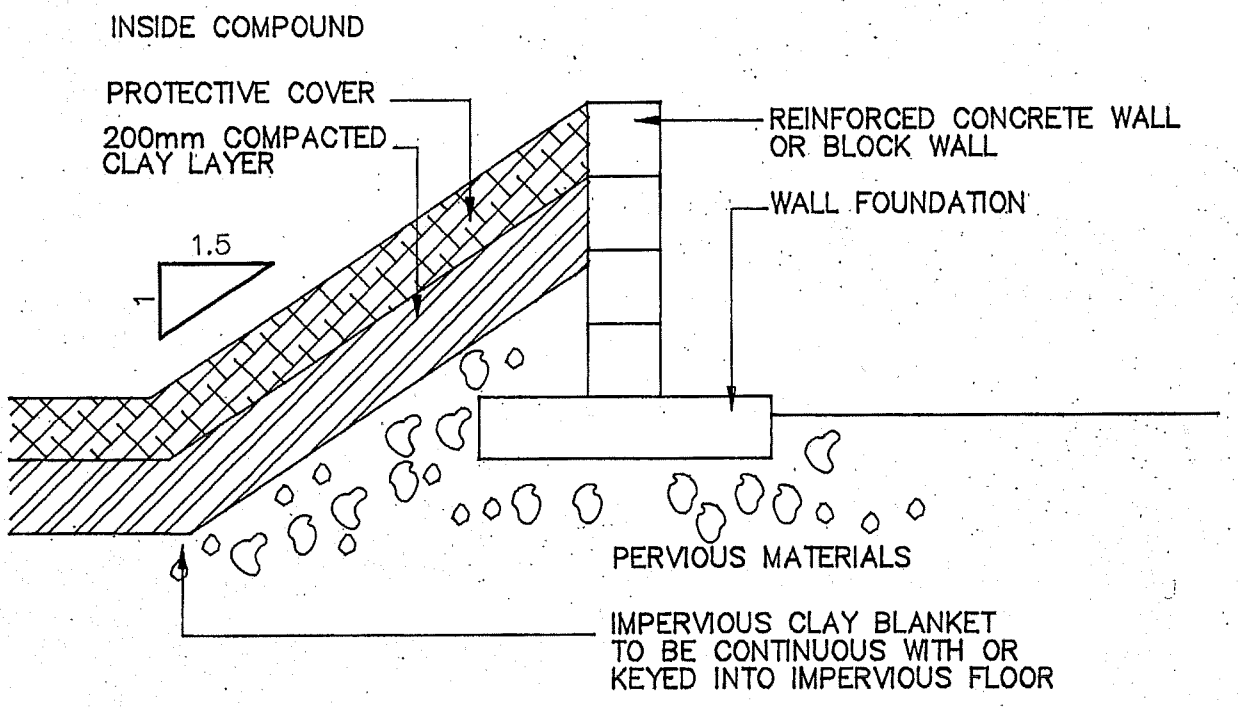


CLAY CORE

EXAMPLES OF EARTH BUND WALLS



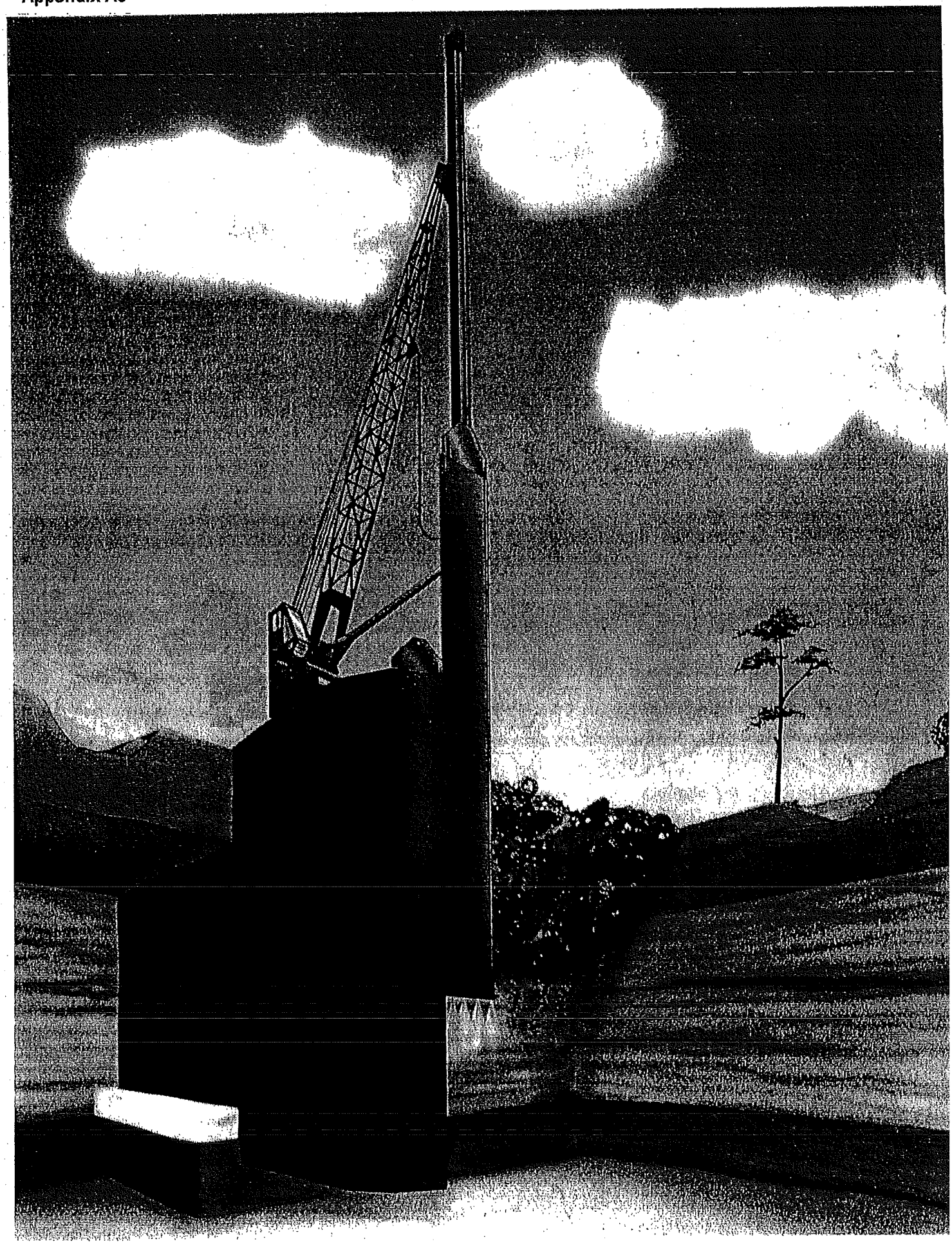
CONCRETE BUND WALL



EARTH/CONCRETE BUND WALL

EXAMPLES OF CONCRETE BUND WALLS

Appendix A6



Stock reconciliation

A daily reconciliation of all movements ex Bulk Storage Tanks must be maintained at facilities to check on possible leakage losses, to check on meter throughputs and to reveal any other loss situations e.g. internal theft, miscalculation of quantity etc.

(1) Electronic systems

Where electronic tank gauging ("E.T.G.") and metering systems are in place proceed as follows:

a) E.T.G. readings must be taken every 24 hours on days when the facility is staffed. This will show all movements ex a Bulk Storage Tank for a 24 hours period.

b) Electronic meter readings must be taken at the same time as the E.T.G readings.

This will show all metered movements for the corresponding 24 hours period.

c) Any other type of movements, such as drum fillings, blends, railcar fillings that are not picked up by the electronic metering system must be accounted for manually.

d) The Bulk Storage Tank movements must then be reconciled with movements through the electronic metering system plus drum filling, blends and railcars.

(2) Manual systems

Where electronic systems are not in place manual gauging and meter reading must be used to monitor losses/gains.

(3) General requirements

(a) Where differences in excess of a figure set by the locality manager for a daily difference and a cumulative difference occur, these must be investigated immediately. The cumulative difference should be in line with the control % set for this product at this location.

(b) Actual Bulk Stocks must be compared against Administration System Book stocks daily on each working day. Where differences as set in (3a) above occur, these must be investigated immediately.

(4) Note: Each facility will have their own method of reconciling Actual and Administration System Book Stocks on a daily basis, depending on the degree of automation present, but wherever possible a spreadsheet or PC produced reconciliation sheet should be used. This working day reconciliation must be initialled by the stocks controller then filed and be available for inspection at all times.

Response to product release

Emergency planning

The operator must ensure that an appropriate response plan is in place to deal with any emergency that may arise, including possible spills, leaks, fire and explosion. It is the responsibility of management personnel to keep a copy on site and to ensure that all staff are familiar with the plan and can implement it promptly in an emergency.

Response plans for product releases

The response plan for any product release must include the following essential steps, some of which can be taken concurrently.

- Assess the situation
- Stop the release at source (if possible)
- If there is a fire or spillage that cannot be controlled on site, call the Fire Service.
- Contain the release if possible.
- Put out the fire if possible with extinguishers on site. Do not use water jets as these will spread the fire.
- If product is flammable, but not burning, remove any potential source of ignition.
- Keep the public away.
- Respond to any emergencies.
- Report the release to the relevant Authorities.
- Re-assess the situation.
- Decide on corrective action in conjunction with the Authority and clean up the released product.
- Do not re-open the site until it is safe to do so.
- Conduct a review of the incident so that lessons may be learnt and a recurrence prevented.

Additional information and guidance

The response plan should also include essential items of guidance and information for easy reference in an emergency. These should include:

- Agencies/Authorities (including phone numbers) to be advised.
- List of spill containment and clean-up equipment available on site, and also from other local and regional sources.
- Assessment of size and extent of the product release. For example:
    1. Able to be contained and cleaned up on site by operator.
    2. Affect off-site areas but can be cleaned up by operator.
    3. Affects off-site environment and requires other agencies to assist clean up.
- Requirements for disposal of contaminated material.
- Handle products according to recommendations set down in "material safety data sheets" (Appendix B).