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CIRIA C736

Relevant Good Practice – Secondary Containment

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SLR

Welcome

Danny Jones

Technical Director Process Engineering – SLR Consulting

Danny is a Technical Director with SLR Consulting and has over 20 years of experience in the management, treatment and disposal of landfill leachate and similar waste waters. In his role within SLR's Process Engineering and Process Safety Group Danny provides consultancy services to a wide range of UK and overseas clients on issues relating to leachate management and treatment of industrial waste waters. Danny was the Lead author for the Code of Practice for UK landfill operators in relation to bunding / secondary containment requirements of infrastructure that contains landfill leachate, the 'UK Landfill Industry Code of Practice 'The Establishment of Appropriate Containment Standards for Leachate Storage Infrastructure'. The document was published in 2017 and is in current use.

Ian Walton

Technical Director - SLR Consulting

Ian Walton is a Technical Director at SLR Consulting. He is a chartered civil engineer with over 30 years broad environmental consultancy experience working for both public and private sector clients. He has been responsible for managing and directing a diverse range of commissions including those in the public health, waste management, infrastructure and general development sectors. Ian is also regularly called upon to provide expert evidence in relation to flooding and drainage issues.

Ian was retained by CIRIA in 2012 to author the update of the R164 design of containment systems for the prevention of water pollution from industrial incidents guided by a Project Steering Group drawn from industry and regulators.

Following publication of the updated guidance, C736, in 2014, he has provided advice to industrial and waste management clients on the compliance of their facilities with current guidance. Ian has also been using his expertise in flood modelling and drainage to review the adequacy of tertiary containment in relation principally to the retention of firefighting water.

Legal Background

Operators that pose a higher pollution risk:

- Environmental Permitting (England and Wales) Regulations 2016
- PPC Regulations (Northern Ireland) 2018
- Environmental Authorisations (Scotland) Regulations 2016 in Scotland.

These operators will be Permitted and Regulated by:

- the EA in England;
- NRW in Wales
- NIEA in Northern Ireland
- SEPA in Scotland

BUT…….**Everyone has to follow UK Law** – it is an offence to cause pollution:

- Environmental Protection Act 1990
- Environment Act 1995
- Environmental Damage Regulations 2015

The Law and Good Practice

Acts of Parliament and their Regulations are '**the Law**'

Regulators publish or endorse Good Practice '**Guidance**'

Good Practice is:

CIRIA C736 'Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises', published in 2014.

- This is Best Available Technique (BAT) for new build facilities, contained in C736
- This is Relevant Good Practice (RGP) for existing facilities, also contained in C736

Failure to maintain adequate containment can lead to Regulator intervention and prosecution should pollution occur.

CIRIA 736

CIRIA 736

- Major update to CIRIA Report 164 (1997).
- CIRIA Report 163 - Construction of Bunds for Oil Storage Tanks withdrawn
- Funded by Environment Agency and SEPA

Purpose of C736

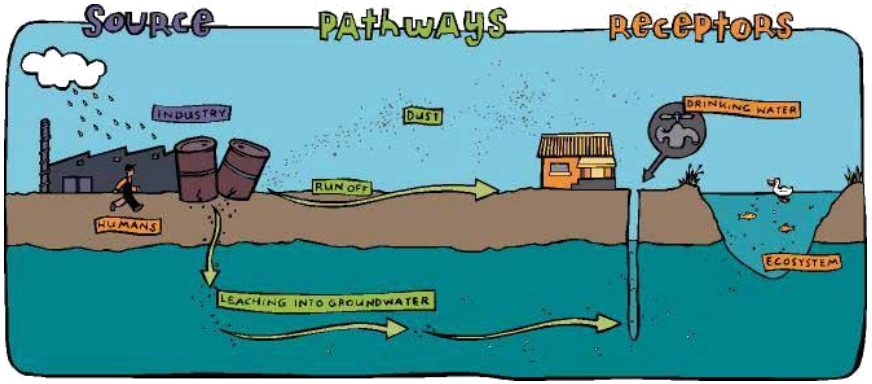
- Reduce the risk of harm to the environment (essentially ground and water) through the storage of hazardous substances – more properly called ‘inventory’

How does C736 achieve this?

- Generally reduce rather completely eliminate the risk
- Risk assessment that ‘balances’ the potential harm against the resources required, i.e. measures that are proportionate to the risk

CIRIA 736 – General Principles

Source – Pathway – Receptor

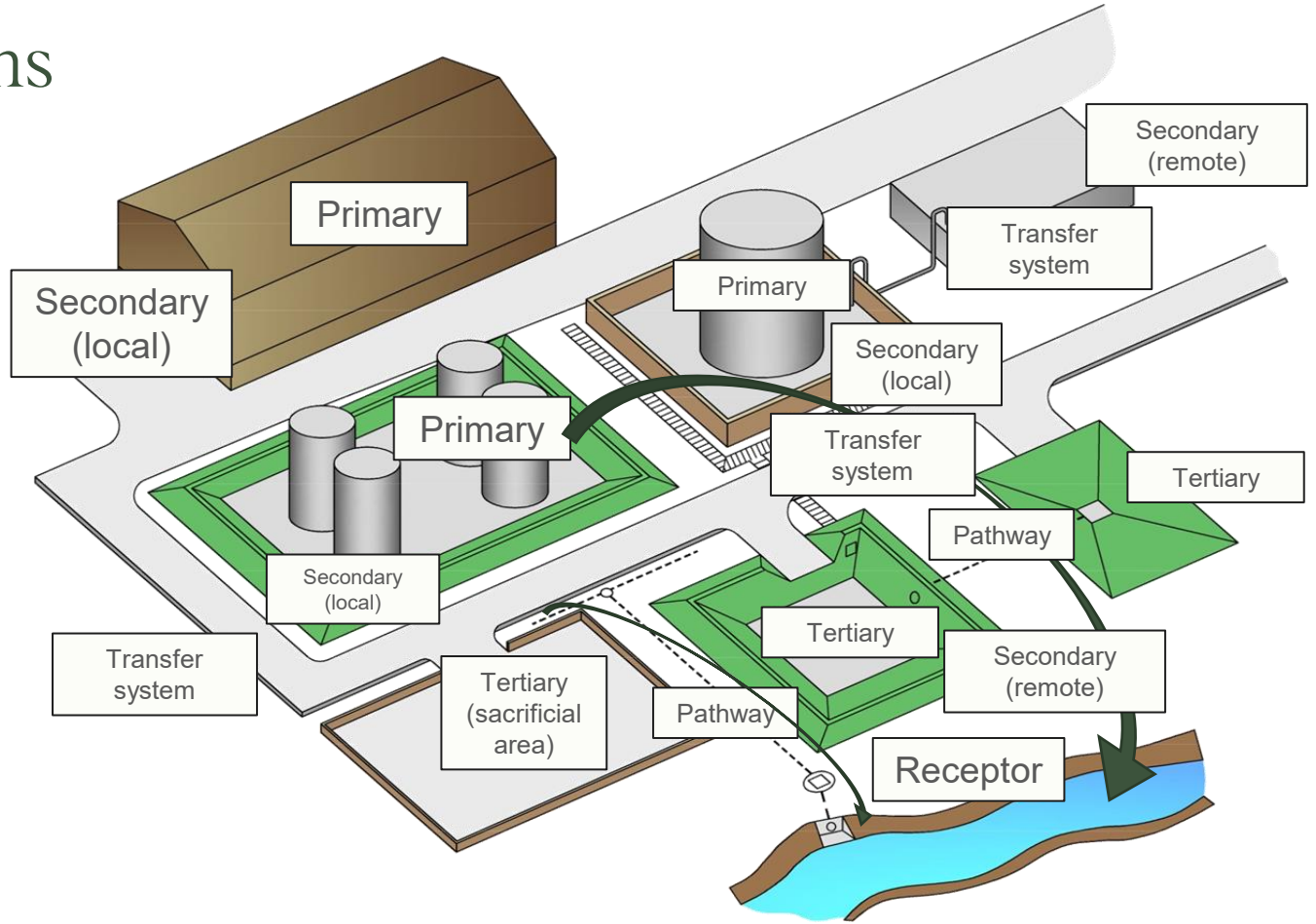


Source and Receptors generally are ‘fixed’

Containment seeks to break or reduce the pathway

Primary Containment

Definitions



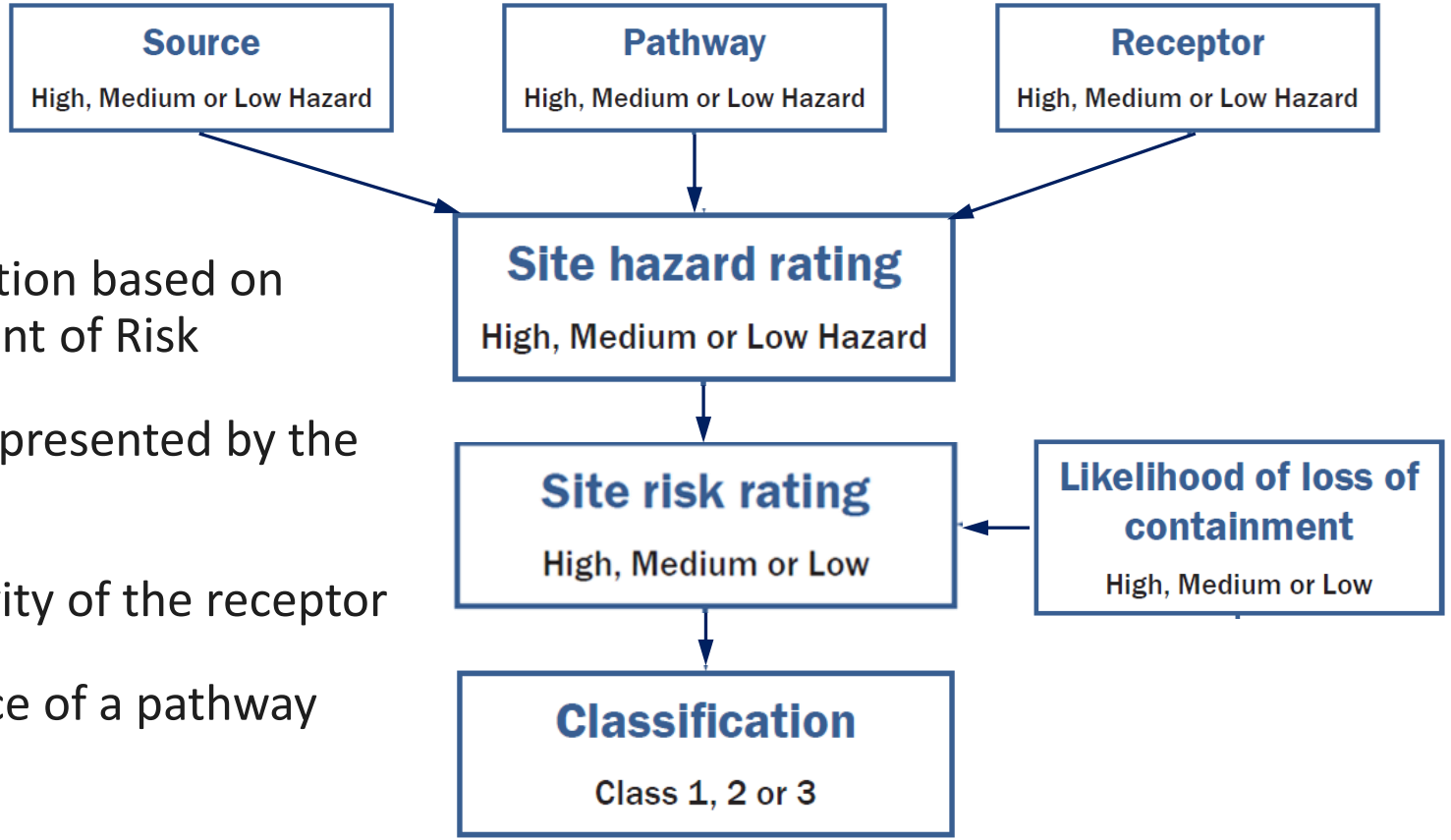
Scope of Guidance

- **Part 1**
  - Introduction
  - Risk Assessment and Classification
  - Containment Options
  - System Capacity
- **Part 2**
  - Assessment of existing installations
- **Part 3**
  - Covers the detail of the design of various containment options

Risk Assessment and Classification

Classification based on assessment of Risk

- Hazard presented by the source
- Sensitivity of the receptor
- Presence of a pathway



Bund Classes

- **Class 1** – Low hazard
- **Class 2** – Medium hazard
- **Class 3** – High hazard

Bund Class impacts on the design, specification and construction of containment:

- Layout – proximity to bund wall to prevent jetting
- Material – reinforced blockwork only permitted for Class 1
- Drainage – gravity drainage of bunds not permitted for Class 2 and 3
- Detailing – waterbars required in kicker joints for Class 2 and 3
- Leak detection – requirement for earthwork bunds, below ground bunds, class 3 bund

Volume of Containment

- **Previous 110% rule**
  - Additional 10% to cover a multitude of sins...
  - Generally adequate to contain firefighting agents (foam) and rainfall
  - BUT still mandatory minimum for some regulations e.g. OSR

- **What has to be contained?**
  - 100% of the contents for single tank
  - For multiple tanks based on credible failure scenario
  - Generally brimful capacity should be adopted
  - Nominal or tank rated capacity may be appropriate
  - Rainfall
  - Firefighting and cooling water applied during an incident

Other Bund Volume Considerations

Freeboard

- Accounts for uncertainty
- Firefighting agents (foam) in addition to inventory and rainfall
- Dynamic effects

Firefighting and Cooling Water

- C736 provides review of methods to provide a first estimate of volumes
- Depends on type of incident and manner of the response
- Vital to involve Fire and Rescue Services
- Likely to be uneconomic to provide local secondary containment
- Manage using remote secondary / tertiary
- Not prescriptive but risk based

Tertiary Containment

Where will firefighting and cooling water go?

Mobilising Storage

Emergency and temporary containment

Existing Facilities – Overview

- **Few new facilities are being constructed, generally**
  - Extensions
  - Modification
  - Upgrading
- **Recent inspection indicate uncertainty with form of construction and compliance with good practice recommendations**
- **Assessment of existing containment facilities**
  - *'Source, Pathway, Receptor' assessment for required bund Class*
  - Gap analysis of what is required versus the existing facility
  - Duty holder responsibility to demonstrate facility is appropriate for the risk
  - Regular reviews and any time that the nature of the inventory changes

Existing Facilities – Focus on C736 Guidance

- **Difference to ‘best practice’ construction**
  - Why it is different to a concrete wall
  - Duty Holder should seek professional advice
  - Not rely on ‘have-a-go’ maintenance staff or local builder
- **Impermeably**
  - Joints
  - Penetrations
  - Earthworks
  - Lining systems
- **Fire resistance**
  - Joints – metal waterbars
  - Penetrations – detailed to allow movement and remain sealed

Existing Facilities – Baseline Surveys

- **Asset Survey**
  - Volume of inventory
  - Type and volume of containment
  - Type of construction
  - Potential leakage pathways (joints, drainage, penetrations etc.)

- **Further Investigations**
  - May be required to establish type of construction
  - Ability to withstand loads – foundations
  - Ability to resist fire – rendered blockwork wall or reinforced concrete
  - Type and detail of joints – fire and chemical resistance able to accommodate movement

Existing Facilities – Baseline Surveys

- **Gap Analysis**
  - Compare bund Class
  - Identify improvements
    - Repair and upgrading
    - Tertiary containment
  - Regulator engagement
  - Aim is to reduce the risk of causing pollution to occur

Note that it is not the intention of the guidance to be a blanket retrospective application to existing facilities

- **Maintenance Plans**
  - Regular maintenance and inspection
  - Requirement of EPC, PPC and COMAH
  - C736 provides some guidance

Existing Facilities – Maintenance and Inspection Regimes

C736 suggest the following checks by **Operational staff**

- **Daily**
  - Visual inspection including drip trays
  - Remove wastes, remove water
  - Note any damage to tanks, leaks, spills and immediate remediation
  - Check alarms and pumps
- **Weekly**
  - Check drain covers/grids
- **After rainfall**
  - Check for excess water

Existing Facilities – Maintenance and Inspection Regimes

Checks by **Works Engineer or similar suitably qualified manager**

- **Annually** – tanks, pipework, loading bays etc
  - Cracks and corrosion
  - Seals and joints
  - Damage
  - Integrity
  - Signage
  - Equipment

Link to a maintenance plan.

Existing Facilities – Maintenance and Inspection Regimes

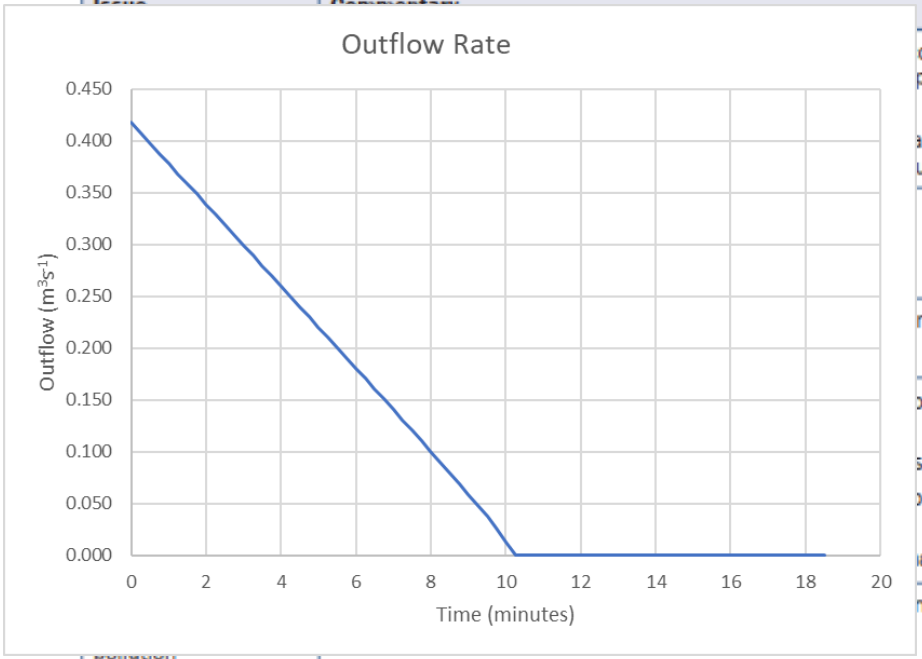
5 yearly (or where changes have occurred)

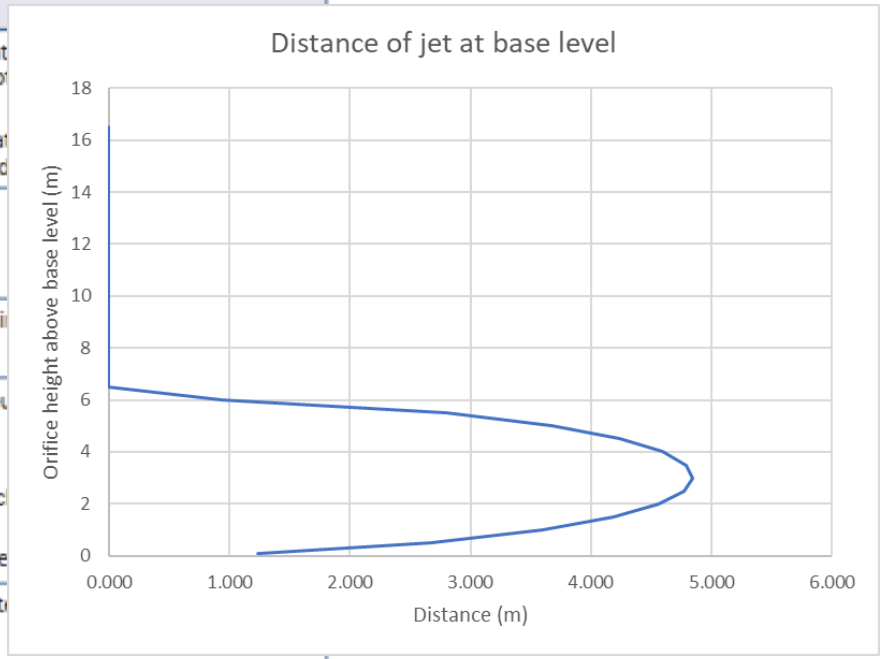
- Site risk assessment and containment classification should be reviewed
- Review details of inspections carried out
- Review maintenance identified, planned and completed

Checks by a **suitably qualified assessor**

- **10+ yearly**
  - Wall thickness NDT
  - Surface inspections
  - Leak detection

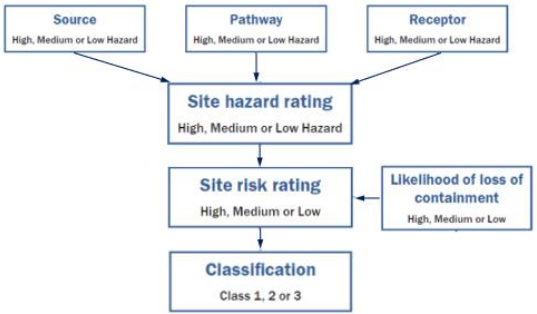
Inclusions and Exclusions





	▪ pollution as a consequence of atmospheric emissions.
Post-incident clean-up	▪ the recovery, recycling or disposal of contaminated chemicals, wash waters, effluents, contaminated fire waters etc (unless this affects the containment system design/selection) ▪ monitoring, clean-up or treatment after the occurrence of an incident.

What should be included in a CIRIA Assessment?



What should be included in a CIRIA Assessment?

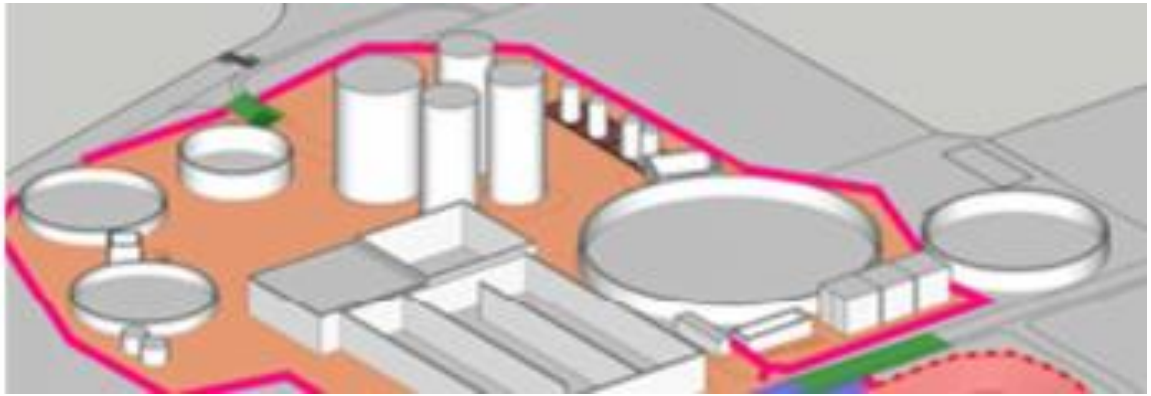


Table 6.2 Summary of key design recommendations

Design issue	Section	Comments
Chapter 4 Containment system capacity		
Fire duration	Box 4.1	All classes
Local secondary containment	4.2.1	All classes
Site-wide capacity	4.3	All classes
Chapter 6 Introduction to bunds (see also Boxes 6.6 and 6.7)		
Height of wall	6.3.1	All classes
Freeboard	Box 6.2	All classes
Proximity to bund wall	6.3.1	Only a consideration for class 2 and class 3
Jetting	6.3.1 and Box 6.3	Only a consideration for class 2 and class 3
Leakage detection from primary containment vessel	6.3.2	Only a consideration for class 3 where primary containment vessel rests on bund floor
Drainage from bunds	6.3.2	No provision for gravity drainage should be made for class 2 and class 3
Pipework	6.3.3	No penetration of the bund wall should be permitted for class 2 and class 3
Impermeability testing	6.3.7	Leak testing of all joints and penetrations upon completion of construction works a requirement of class 2 and class 3
Structural independence	6.3.10	All classes although integrally bunded tanks may be suitable for class 1
Chapter 7 In situ reinforced concrete and masonry bunds		
Competence	7.2.1	Design and construction should be completed by competent personnel
In situ reinforced concrete bunds	7.2.2	Design EN 1992-3:2006 as liquid containing and retaining structure
Joints	7.2.4	Waterbars to be installed in expansions and contraction joints and be resistant to attack by inventory and fire resistant where flammable inventory is stored
Kicker joints	7.2.4	Waterbars installed in kicker joints for class 2 and class 3
Reinforced masonry bunds	7.3.1	Only suitable for class 1 and where inventory is not flammable
Chapter 8 Earth banked containment basins (lagoons), earth bunds and earth floors		
Competence	8.1	Design and construction should be completed by competent personnel
Site investigation	8.1	Detailed site investigation required for all classes to BS EN 1997-2:2007
Design	8.1	Design to be in accordance with BS EN 1997-1:2004
Maximum permeability of soils used for earth embankment construction	8.2.1	1×10^{-9} ms^{-1}
Earth floors to bunds and lagoons	8.2.1	Equivalent of 1 m depth of soil with a maximum permeability of 1×10^{-9} ms^{-1}
Liner	8.3	Required for class 2 and class 3 unless a significant depth of *in situ* low permeability soil is present in which case this may be relaxed in consultation with the regulator
Leak detection	8.3	Required for class 3 unless a significant depth of *in situ* low permeability soil is present in which case this may be relaxed in consultation with the regulator
Chapter 9 Containment tanks (see also Tables 9.1 and 9.2)		
Leak detection	6.3.2	For class 3 leakage detection where tank rests directly on the ground
Chapter 10 Transfer systems (see also Table 10.1)		
Catchment surfacing	10.4	Resistant to inventory and fire plus additional redundancy for higher classes
Catchment construction	10.5	Number of options available including soils, paving, concrete slabs and asphalt and dense bitumen macadam
Transfer system capacity	10.4	Designed to cater for flows arising from a credible scenario

Obtaining the guidance

- CIRIA publication C736 Containment systems for the prevention of pollution can be freely downloaded from the CIRIA website.

- Please do register with CIRIA and download the document rather than circulate a copy as this enables CIRIA to keep track of who has copies and will be able to email you notice of any updates.

Obtaining assistance

SLR Consulting can provide a range of Consultants who can help Operators discharge their duties under CIRIA C736.

- SLR can provide services such as
  - Inspection of containment facilities
  - Gap analysis against RGP and BAT requirements
  - Development of improvement plans
  - Negotiation with Regulators
  - Drainage and hydrology studies
  - Spill modelling
  - Climate change and resilience analysis
  - Tertiary containment and firewater modelling

Do you have any questions?

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