8.7 REPAIR AND REPLACEMENT OF SECONDARY CONTAINMENT AND LDS

Repair and replacement of any element of the base system should be essentially treated in the same way as the original installation. All of the issues covered in this guidance are applicable, but can be informed by feedback from other projects, ongoing monitoring and integrity testing.

Repair and replacement work should be fully inspected and recorded to update those records and procedures already in place. All repairs and refits should be inspected pre-conversion, following any site-specific WSE, as discussed in 8.1. As with all operations, feedback should be provided to all interested parties. This could include other teams designing similar projects, in order that they can either avoid any difficulties arising from the design or better facilitate repair and replacement work.

Feedback should also be provided to the site and wider operations to let them know what is involved in doing such work and equally importantly, to identify any day-to-day practices that could be changed in respect of the secondary containment systems.

8.8 DOCUMENTED RESPONSE PROCEDURES

Site operational procedures should include documented procedures for responding to foreseeable events, such as general maintenance and improvement works, major tank work and maintenance or overhaul work. The procedures should also cover emergency situations ranging from significant leaks up to major incidents.

The procedures will include measures to safeguard items such as liners and LDSs. They should also include strategies for checking or reviewing the condition of the secondary containment features.

8.9 INTEGRATION WITH OTHER SECONDARY CONTAINMENT

The under-tank secondary containment and LDSs will, in most situations, form part of a wider secondary containment system such as a bunded area. This may include a secondary containment liner and various forms of hydrocarbon detection systems. Even if it has none of these features, it is still secondary containment relying on the nature of the bund floor and perimeter bunds to provide the required degree of impermeability.

Consideration should be given to whether the tank's secondary systems are regarded as part of the tank, or are part of the containment bund system. This influences where the under-tank systems will be found in record systems, and in management/inspection regimes.

The under-tank systems are considered as part of the wider bund system covered in the companion guidance for bunds, EI *Guidance on conceptual design, selection and life cycle assurance of liners intended to improve integrity of bunds to above-ground storage tanks for bulk storage of petroleum, petroleum products or other fuels*. The procedures in that guidance can be adopted for the under-tank components, where appropriate. The principles of documented procedures, updating information and providing feedback all should be incorporated into appropriate systems.

The EI publication *Guidance on conceptual design, selection and life cycle assurance of liners intended to improve integrity of bunds to above-ground storage tanks for bulk storage of petroleum, petroleum products or other fuels* provides information on LIPs or bund passports as a means of collating and managing all of the information, records and procedures necessary to manage and control the secondary containment assets.

8.10 FEEDBACK

Feedback from all aspects of the operational phase can be used for future designs and for operation of the asset in question, and others. Many aspects of the feedback will be appropriate for other sites and there should be a means of regularising its collection and distribution. In-service feedback is also of interest to the wider industry as a whole and it may be possible to provide this to external organisations (e.g. the EI) for the purpose of continual development of good practice.

9 DECOMMISSIONING

9.1 INTRODUCTION

Decommissioning (stage 4) of the base system life cycle deals with the end of life of the below tank secondary containment and LDSs, as detailed in Figure 16.

This can be either:

– end of use with the base system left intact, with or without the tank, and
– complete decommissioning with the entire base system removed.

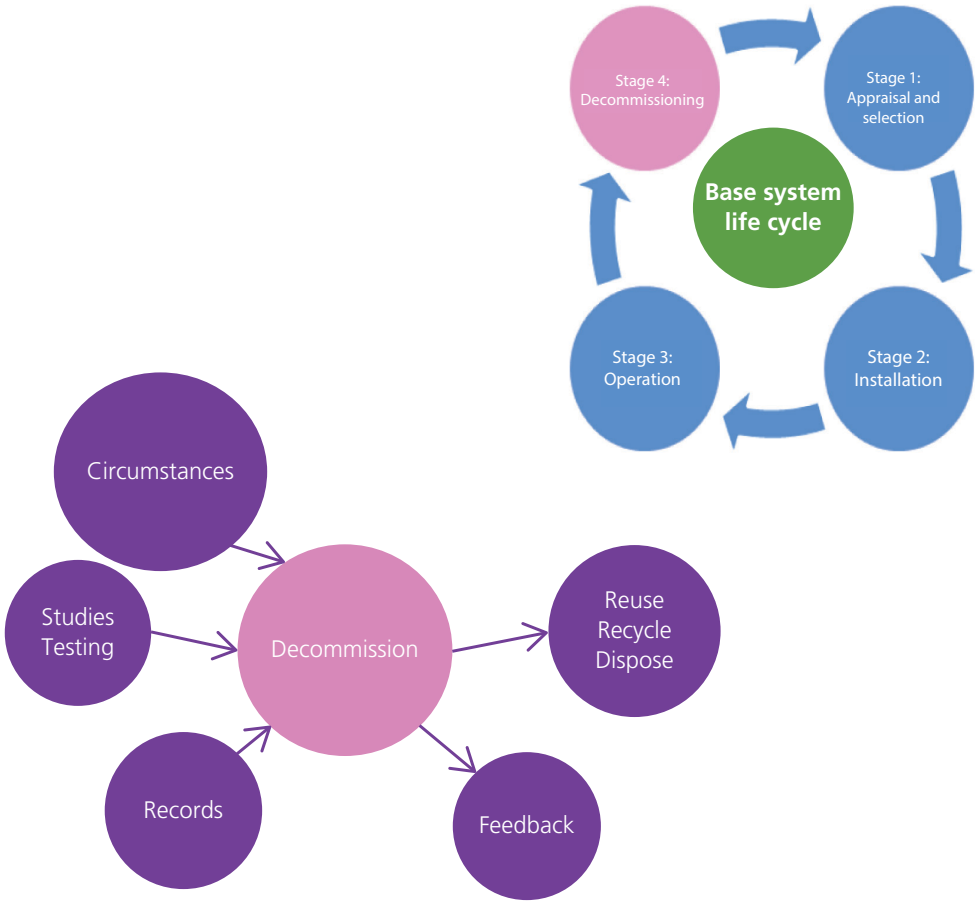

Figure 16: Base system life cycle stage 4: decommissioning

9.2 END OF USE

This circumstance can arise when a tank is taken out of use or is demolished, but the base system is left in place. Where this occurs in a fully operational site, it is expected that all of the controls discussed in previous sections will still apply. However, if the base system is being left in an uncontrolled environment, some further issues should be considered.

The principal concern is migration of leakage, either historical or from a remaining aged tank. There is the potential for some aspects of the old base system being hazardous to wildlife colonising the site. If it is intended that the base system be left in an uncontrolled area, a full desk study, and site investigation, should be carried out.

The term 'uncontrolled' in this context means an area that is not subject to normal site operational standards. Such areas should still be subject to normal industry levels of security. Where a site is to be abandoned or vacated, complete decommissioning should be carried out.

9.3 COMPLETE DECOMMISSIONING

Where a tank base system is to be completely removed, the issues arising are those for a typical industrial site. In such circumstances, the recognised procedure would be to carry out a desk study, carry out site investigation and develop procedures and specifications to be adopted in the decommissioning work. Clearly, this would depend on good quality records from the original construction and through the lifetime of the base system.

9.4 REUSE, RECYCLING AND DISPOSAL

Materials should be identified and segregated during decommissioning to meet legislation and comply with good disposal practice. Decommissioning should aim to maximise the opportunity for recovering materials that are recognised as recyclable. Currently, such materials may include:

– thermo-plastics from liners, pipes and conduits;
– sand and aggregate;
– secondary aggregate from concrete, and
– metals from access covers etc.

In contrast, there appears to be little prospect of recovery or reuse of bentonite and reinforced resins or plastics. Arisings are likely to be too low in volume to justify investment and development of innovative dedicated processes for these materials.

The material above the secondary containment has the potential to be contaminated. This may not be from tank leaks, but, particularly in the case of cone down tanks, can be from external spillages migrating under the tank. This can only be determined immediately in advance of removal by standard testing and segregation techniques. Depending on the degree of contamination and the volumes of materials involved, there may be an opportunity for treatment rather than disposal as contaminated material.

9.5 TESTING AND FEEDBACK

Exposure of base system elements during full decommissioning offers the opportunity to obtain samples of liner materials and joints or connections. Close examination or testing of these can provide useful feedback into the design and specification process. Some findings may be of wider interest and consideration should be given to making the information more widely available, e.g. via the EI.

ANNEX A
COMMENTARY ON RELEVANT GB AND EUROPEAN LEGISLATION, AND INTERNATIONAL PUBLICATIONS

A.1 INTRODUCTION

This annex provides a commentary on relevant GB and European legislation, and international publications that were received in a literature review so as to inform the development of this publication. Table A.1 provides relevant GB and European legislation (and associated regulatory policy documents), whereas Table A.2 reviews international publications.

Table A.1: Relevant GB and European legislation

Reference	Reason for review	Relevant content/ comment
Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the community action in the field of water policy ('Water framework directive'). Implemented through the Water Environment (Water framework directive) (England and Wales) regulations (2003)	European directive and national legislation underpinning protection of the water environment	Requires protection and where necessary improvement of all water bodies (including groundwater) to 'good' status
Directive 2004/35/EC of the European Parliament and of the council of 21 April on environmental liability with regard to the prevention and remedying of environmental damage (Prevention and Remediation) regulations (2009). Implemented in Scotland through the Environmental Liability (Scotland) regulations	European directive and national legislation underpinning polluter pays and environmental restoration principles	Requires the remediation of environmental damage caused by accidents or operational activities. Applies only to damage came into force (i.e. no retrospective action)
COMAH Competent Authority *Policy on containment of bulk hazardous liquids at COMAH establishments ('Containment policy')*	Primary regulatory policy statement	Details requirements for primary, secondary and tertiary containment, as established by BMIIB findings and recommendations

Table A.1: Relevant GB and European legislation (continued)

Reference	Reason for review	Relevant content/ comment
COMAH Competent Authority *Containment of bulk hazardous liquids at COMAH establishments – Containment policy: Supporting guidance for secondary and tertiary containment and implementation principles for regulators (Containment policy implementation principles)*	Primary regulatory guidance	Detailed guidance on the implementation for regulators
COMAH Competent Authority *Policy on containment of bulk hazardous liquids at COMAH establishments – Containment policy: Supporting guidance for secondary and tertiary containment ('Containment policy supporting guidance')*	Primary competent authority guidance	Detailed guidance on achieving compliance with regulatory requirements. Likely first reference for dialogue between operating companies and COMAH CA. Includes permeability specifications for under bund and below-tank liners
Directive 99/92/EC of the Eurpoean Parliament and of the council of 16 December 1999 on minimum requirements for improving the safety and health of workers potentially at risk from explosive atmospheres (ATEX 137) ('ATEX workplace directive') and safety aspects of council directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work ('Chemical agents directive') and implemented in the GB through the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002	Primary legislation covering flammable atmosphere hazards	Statutory control over operations applies at all facilities storing petroleum product, including those below GB COMAH threshold requirements. Integration with COMAH and facility design to prevent conflict/non-compliance

Table A.1: Relevant GB and European legislation (continued)

Reference	Reason for review	Relevant content/ comment
Environmental permitting regulations (England and Wales) (amendment) (2013) and Environmental permitting (England and Wales) amendment No. 2 regulations (2013). Similarly in Scotland, Pollution prevention and control regulations (Scotland) (2012). In England and Wales the 2007 regulations usurp Pollution prevention and control (England and Wales) regulations, 2000. Their scope has since been widened in the 2010 regulations to include water discharge and groundwater activities, radioactive substances and provision for a number of directives. The 2013 amendment brought in *Directive 2010/75/EU of the European Parliament and of the council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) ('Industrial emissions directive (IED)')*	Primary operational permitting regime	Statutory conditional permit scheme applied to all operating bulk storage sites. Integration with COMAH and facility design to prevent conflict/non-compliance
Council directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances ('Seveso II directive') (as amended). Implemented in GB as the Control of major accident hazards regulations ('COMAH') 1999 (as amended)	The COMAH regulations were a direct implementation of the *Seveso II directive*; however, from 1 June 2015 they have been realigned to the 'Seveso III' directive	Requires COMAH establishments to take all measures necessary with regard to the containment of hazardous liquids, to prevent major accidents and limit their consequences to persons and the environment
Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident and hazards involving dangerous substances, amending and subsequently repealing council directive 96/82/EC ('Seveso III directive') Implemented in GB as the Control of major accident hazards regulations ('COMAH') 2015	The COMAH 2015 regulations are a direct implementation of the *'Seveso III' directive*	Revision of *Seveso II directive* and COMAH 1999 to include increased public information availability, and more EU-wide coordinated inspections

Table A.2: Relevant international publications

Organisation/ publisher	Reference	Reason for review	Relevant content/ comment
ACI	350-06 *Code requirements for environmental engineering concrete structures*	International standard	Concrete specific
API	Publication 315 *Assessment of tankfield dike lining materials and methods*	Good practice assessment of diking methodology	Installation considerations, durability assessment, excludes QA/QC below tank linings. Historical individual state requirements; comparison of materials, selection criteria
API	Publication 322 *Engineering evaluation of acoustic methods of leak detections in aboveground storage tanks*	International standard for AET, a form of LDS	Summary of acoustic LDS, methodology, advantages and disadvantages
API	Publication 325 *An evaluation of a methodology for the detection of leaks in aboveground storage tanks*	International standard evaluating LDS	Summary of LDS, and a way to evaluate PD and false alarms
API	Publication 328 *Laboratory evaluation of candidate liners for secondary containment of petroleum products*	International assessment of RPB liner types	
API	Publication 334 *A guide to leak detection for aboveground storage tanks*	International standard for LDS	Summary of LDS methodology, advantages and disadvantages
API	Publication 340 *Liquid release prevention and detection measures for aboveground storage facilities*	International standard for RPBs and LDSs	

Table A.2: Relevant international publications (continued)

Organisation/ publisher	Reference	Reason for review	Relevant content/ comment
API	Publication 341 *A survey of diked-area liner use at aboveground storage tank facilities*	Survey of installed liner sites	Very negative viewpoint on lining of secondary containment. Provides practical examples of poor design and related problems
API	Standard 650 – *Welded tanks for oil storage*	International review of LDSs	
API	RP 575 *Inspection practices for atmospheric and low-pressure storage tanks*	International standard for ASTs inspection	Concepts for WSE for inspection
API	Standard 653 *Tank inspection, repair, alteration, and reconstruction*	International standard for ASTs	
ASTM	D5126/D5126M – 90	International (US) standard	Soil-specific test methodology
BSI	BS 476–10:2009	Cross-referenced construction standard	Fire resistance testing
BSI	BS 8007:1987	Cross-referenced construction standard	Concrete specific
Buncefield Major Incident Investigation Board (BMIIB)	*The Buncefield incident 11 December 2005: The final report of the Major Incident Investigation Board Volume 1*	Investigation board recommendations for improvements	Provides insight into risks from real incident perspective. Investigation board recommendations transposed in HSE *PSLG Final report*
Buncefield Major Incident Investigation Board (BMIIB)	*The Buncefield Investigation: Third progress report*	Investigation board recommendations for improvements	Provides insight into risks from real incident perspective. Superseded by BMIIB *The Buncefield incident 11 December 2005: The final report of the Major Incident Investigation Board Volume 1*

Table A.2: Relevant international publications (continued)

Organisation/ publisher	Reference	Reason for review	Relevant content/ comment
CEN	EN 14015:2004	Cross-referenced construction standard	AST specific
CEN	EN 1992-3 Eurocode 2	Cross-referenced construction standard	Concrete specific
CIRIA	C598 *Chemical storage tank systems – good practice. Guidance on design, manufacture, installation, operation, inspection and maintenance*		Focuses on tank construction and inspection. Limited focus on tank base, other than foundation preparation
CIRIA	C736 *Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industry and commercial premises*	Best practice and practical guidance	Supersedes R164. Updated with risk assessed approach. Relevant to new and retrofit
EEMUA	Publication 159 *User's guide to inspection, maintenance and repair of above ground vertical, cylindrical, steel storage tanks*	Industry standard	
EEMUA	Publication 183 *A guide for the prevention of tank bottom leakage design and repair of foundations and bottoms of vertical, cylindrical, steel storage tanks*	Industry standard	

Table A.2: Relevant international publications (continued)

Organisation/ publisher	Reference	Reason for review	Relevant content/ comment
EEMUA	Publication 231 *The mechanical integrity of plant containing hazardous substances. A guide to periodic examination and testing*	Industry standard	Reference to WSE for assets
EI	*Guidance on conceptual design, selection and life cycle assurance of liners intended to improve integrity of bunds to above-ground storage tanks for bulk storage of petroleum, petroleum products or other fuels*	EI good practice	General design and operational guidance
EI	*Model code of safe practice part 2: Design, construction and operation of petroleum distribution installations*	EI good practice guidance	General design and operational guidance
EI	*Model code of safe practice part 19: Fire precautions at petroleum refineries and bulk storage installations*	EI good practice guidance	General operational guidance
Environment agencies	PPG 2 *Above ground oil storage tanks*	UK regulatory and operational guidance	General advice for primary, secondary and tertiary containment around above-ground tanks
Environment agencies	PPG 21 *Incident response planning*	UK regulatory and operational guidance	General advice on spill (and other incident) responses
HSE	HSG 176 *The storage of flammable liquids in tanks*	HSE good practice	Similar practical criteria to CIRIA/EA documents