Thermoplastic tank integrity management

Advice to users

Guidance Note PM86

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

Guidance Notes are published under five subject headings:

Medical
Environmental Hygiene
Chemical Safety
Plant and Machinery
General

Scope

1 HSE has produced this good practice guidance note in consultation with industry. It outlines essential requirements to safeguard against the failure of thermoplastic tanks in service.

2 This document gives guidance on the specification, design, manufacture, transportation, installation, operation and inspection of fixed and permanent thermoplastic tanks. It is for all who specify, install or use such tanks. If you follow this advice then the likelihood of an incident will be reduced.

3 This guidance does not preclude the use of alternative strategies and arrangements which provide equivalent or higher standards of safety.

4 The document does not extend to the precautions to be adopted by the manufacturer during the production of tanks, nor is it intended to apply to intermediate bulk containers (IBCs), road tankers, tank containers or temporary installations.

Introduction

5 Thermoplastic tanks have a variety of applications and are very common in the chemical, food and drink industries for storing a wide range of materials, some of which are classified as hazardous.

6 Many thermoplastic tanks are produced annually and while the vast majority perform satisfactorily, users should note that there have been a number of tanks that have failed in service, some with serious consequences. To reduce the risk of such failures the user should be aware of what can go wrong and, more importantly, how to avoid it.

7 There has been a commonly held misconception that thermoplastic storage tanks can be ‘fitted and forgotten’, as they are frequently portrayed as having good chemical resistance with no need for maintenance or examination up to their design life. You should be aware this is not the case and should take suitable measures to make sure that thermoplastic tanks are correctly specified, examined and maintained throughout their life.

8 Investigation into tank failures has shown that designers and manufacturers are not always made fully aware of the exact operating conditions that need to be withstood. This lack of information is one of the most common causes of in-service problems.

9 Tanks that have been correctly specified, designed and manufactured for the required duty can be further safeguarded if users ensure they are installed, operated, examined and maintained in accordance with relevant standards and manufacturer’s recommendations.

10 In accordance with good working practices, you should keep records for each tank, including the original user specification, the manufacturers’ documentation and calculations, installation documentation and records of all examinations.

Thermoplastics

Material selection

11 Thermoplastic materials have been used for a number of years for the storage of chemicals. They offer excellent corrosion resistance to a wide range of liquids at ambient temperatures.

12 Materials most frequently used for the manufacture of thermoplastic tanks are:

- HDPE (high-density polyethylene);
- PP (polypropylene);
- PVDF (polyvinylidene fluoride); and
- PVC (polyvinyl chloride).

13 Thermoplastic materials have a desirable balance of physical properties and chemical inertness. They are tough, flexible materials that are chemically inert. This must be balanced against their dimensional instability under prolonged load and their relatively low softening temperature. These characteristics should be taken into account at the design stage. Thermoplastic materials are also good electrical insulators so static build-up should be considered at the design stage. This is particularly important for tanks that will be sited in areas where sources of ignition are controlled.

14 All tank design procedures are required to take into account compatibility between the thermoplastic material and the contents, working temperature, and anticipated loading by the contents. They must also define the design life of the tank. Where appropriate, factors should be taken into account for wind, personnel and snow loading and equipment attached to the tank.

Manufacture/design considerations

15 Tanks built after 2000 should have been constructed to the requirements of a suitable standard such as BS EN 13575,[1] BS EN 12573,[2-5] BS EN ISO 1778[6] or BS EN 13341.[7] Manufacturers should work to an appropriate standard which simplifies quality control. Prospective purchasers should seek advice from the manufacturer regarding a suitable standard for the design and construction of new tanks and vessels.

16 In the case of tanks not manufactured in accordance with a recognised design code at date of manufacture, it is recommended that the tank be assessed against a suitable current standard, by the manufacturer or a competent person, in order to verify its continued fitness for service.

17 The user should make sure that the tank being ordered meets all of the design criteria required of it. It is important that users understand what they are purchasing and do not assume that the tank has the required properties. For example, if the roof is required to withstand the weight of a person (which may be necessary for internal inspections where the access manway is in the roof) then this needs to be made clear to the fabricator and the tank designed accordingly.

18 Details of polymer welding qualification testing are given in BS EN 13067: 2003.[8] Skilled welders should be used when manufacturing thermoplastic tanks. Formal welding qualifications provide one route for competency assurance. In-house competency assurance schemes offer an alternative route. Ideally, such schemes should be externally accredited.

19 You should make sure that the design facilitates any inspection requirements deemed necessary by the competent person. Where a tank is too small to facilitate entry for internal inspection, you should make sure all degradation mechanisms that may exist have been identified in order to establish inspection requirements. This may include remote, visual, internal inspection.

20 Appendix 1 outlines the information you should supply to the manufacturer to help ensure the procured tank is fit for purpose. In addition, the manufacturer should provide you with full details of the design. Independent verification of design and construction should be sought for tanks on hazardous duties to provide a degree of assurance regarding initial integrity.

21 The operating requirements specified by the tank owner, and the calculations by the supplier to determine the design life and critical features of the tank, should form the basis of the documentation retained for the life of the tank.

Legal requirements

22 This section highlights regulations of particular relevance to tank integrity management. Additional guidance and information, which may help dutyholders understand their legal duties arising through the life cycle of a thermoplastic tank, is given in 'References'.

Health and Safety at Work etc Act 1974 (HSWA)

23 The general duties in Sections 2 to 4 and 6 to 8 of the Health and Safety at Work etc Act 1974 apply to all work activities that are the subject of this guidance. These duties include requirements on employers to, so far as is reasonably practicable, provide and maintain safe systems of work, ensure the health and safety of their employees, and conduct their undertakings in such a way as to ensure that anybody else who could be affected by the work activity is not exposed to risks to their health and safety. This includes ensuring that risks arising from the potential failure of a thermoplastic tank are properly assessed and controlled.

Provision and Use Of Work Equipment Regulations 1998 (PUWER)

24 Operators of thermoplastic tanks have a duty to maintain the integrity of these items in order to prevent harm to people as a result of a loss of containment. Guidance on these Regulations is available in the Approved Code of Practice, L22.[9] Duties include a requirement to ensure the tank is suitable for the intended use, is maintained in an efficient state, efficient working order and in good repair (achieving a safe condition), and is inspected to ensure it is, and continues to be, safe for use. Inspections must be carried out by a competent person (which could be an employee with the necessary skills and expertise to perform the inspection) and an inspection record must be kept until the next inspection. This requires the adoption of a suitable inspection regime to verify the continued fitness for service of the tank throughout its life.

Control of Major Accident Hazards Regulations 1999 (COMAH)

25 Operators of establishments where there are thermoplastic tanks containing hazardous materials will, where the establishment is subject to the COMAH Regulations, have a duty under COMAH regulation 4 to take all measures necessary to prevent major accidents and limit their consequences to people and the environment.

26 Compliance with COMAH regulation 4 will go in hand with compliance with PUWER Regulations. This includes taking steps to ensure the tank is correctly specified, designed to an appropriate standard, manufactured, installed and operated correctly, and that integrity is maintained throughout the service life to prevent a loss of containment which could give rise to a major incident. Taking 'all measures necessary' includes establishing a suitable inspection regime based on a documented scheme of examination which takes account of all relevant degradation mechanisms.

Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR)

27 A number of Approved Codes of Practice (ACOP) have been published under DSEAR. The most relevant of these for users of thermoplastic tanks is L135: *Storage of dangerous substances* (L135)[10] which contains further information on the design, installation, and use of tanks for the storage of flammable liquids.

Installation

28 As the impact strength of some thermoplastics can be compromised at low temperatures, care should be taken, in line with advice from the manufacture, during handling, transportation and installation when temperatures fall below 0°C .

29 Thermoplastic tanks generally have a flat bottom and must be installed on a continuous horizontal, smooth, flat surface, such as a load-bearing concrete pad. The berthing site should be inspected before installation to identify any defects or debris. Corrective action should be taken, if necessary, to clear the site before the unit is berthed.

30 The tank must be put on a stable base. Unstable materials such as sand or bitumen should not be used as a bedding layer between the tank base and the flat surface, as the loss of the layer will cause uneven stresses in the tank base. This may lead to mechanical failure or induce chemical deterioration in the tank base.

31 The tank should only be lifted using any lugs or other attachments designed for this purpose, and in accordance with the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER). Guidance on LOLER is available in Approved Code of Practice L113.[11] Fittings and connections attached to the tanks should not be used. If a direct lift is to be made on the body of the tanks then, in accordance with BSEN 12573-1, wire ropes or chains must not be used. Appendix C of this standard gives details of the use of a fibre strap (minimum width 75 mm) for lifting and how it should be fitted. The tank should be carefully handled at all times to prevent impact damage.

32 Where temporary storage is required, you should take care to store on a flat surface, clear of any debris, protected from the risk of impact, and in its correct orientation. The unit should be anchored to prevent any movement, eg due to wind. You should consult the tank manufacturer for advice regarding suitable supports to avoid damaging the tank if it is not practicable to store it in the correct orientation.

33 It may be possible to use water to anchor a tank to prevent movement during storage, but you should take care to ensure the tank can hold the weight of the water used and that all the water is removed prior to lifting. It may also be necessary to ensure the inside of the tank is dried before the intended contents are introduced.

34 Tanks installed near to roadways or other areas of vehicle movement should be provided with suitable impact barriers.

35 Installed tanks should be anchored using attachments designed for this purpose and included in the original tank design calculations. The attachments may need to be designed to prevent an empty tank floating in the secondary containment where this is a possibility.

36 A pre-commissioning examination will provide useful baseline data. Subsequent data can then be gathered and compared with the baseline to help determine if any degradation has occurred. More details are provided in paragraph 40.

Operation and maintenance

37 In-service integrity of tanks is maintained by correct operation and suitable maintenance including periodic examination.

Operation

38 Thermoplastic tanks should be operated within defined safe operating limits, based on the original design or a revised duty verified by a competent person.

39 Should a tank be subjected to conditions outside the defined operating limits, this should trigger a review of the possible effects arising from the deviation by a competent person to determine whether the item remains fit for service.

Examination

General requirements

40 After installation and before use, a competent person should inspect the unit to measure and record the tank dimensions and confirm:

- the tank is manufactured to the required standard and is fit for purpose;
- temperature and loading parameters are correct;
- the characteristics of the foundations, hold down equipment and pipework loads are correct; and
- appropriate valves, plugs, drains etc and any instrumentation have been fitted.

41 A pre-commissioning examination provides a record of the as-new condition. This sets a baseline against which degradation can be judged when assessing the results of future examinations. It also confirms that no damage has been caused to the unit before first use.

42 Subsequent internal and external inspections should be undertaken at appropriate intervals as determined by the user and competent person. The first internal inspection is particularly important to verify the design, construction and correct installation of the unit.

43 The scope, nature and frequency of inspections should be informed by a range of factors, which include the design and construction standards, operational experience, experience with similar tanks and contents elsewhere, foreseeable modes of failure, and the consequences of failure. Inspection requirements should be documented in a scheme of examination.

44 All internal and external examinations should be recorded and the competent person should issue an examination report indicating fitness-for-purpose for continued used until the date of the next examination (which should be stated) or alternatively indicating remedial work necessary for continued use.

45 Following an accident, an impact, an excursion beyond allowable operating limits or a change of operating conditions it will usually be necessary to subject the unit to a further examination outside the normal periodic examination schedule to verify ongoing integrity.

46 Routine (eg daily, weekly, monthly) visual external checks of thermoplastic tanks and their secondary containment area represent good practice. Check records should be kept at least on a monthly basis. Such checks may be carried out by operating staff trained to identify early indicators of integrity problems. Routine checks enable prompt corrective action to be taken in the event that a weep or leak is identified.

47 The secondary containment around the tanks should be inspected to make sure that it has not collected rainwater that would reduce the secondary containment capacity in the event of a spillage. The secondary containment should also be examined for any product leakage. Where it is not possible to visually inspect for liquid levels in the secondary containment, provision should be made for monitoring liquid levels, checked on at least a weekly basis.

48 Thermoplastic tanks should have a finite design life stated when new which will identify the time at which an 'extension of life' inspection and assessment should be carried out by a competent person, or the tank taken out of service.

49 Where the design life of a tank currently in service is unknown, a technical assessment should be made by a competent person to determine a residual design life to inform the inspection regime.

50 If it is concluded that the tank may remain in service beyond the original design life, the competent person should review and update the inspection regime, taking account of all relevant factors including any potential age-related degradation mechanisms.

51 Records of the initial specification, including the intended contents, the manufacturer's design documentation and calculations, records of initial (installed but before use) and subsequent examinations, both internal/major examinations and the more frequent external examinations, should be maintained for each tank.

External examination

52 External examination requirements should be specified in the documented scheme. Where tanks are located outside, external examinations are best undertaken in dry weather to aid detection of weeps or leaks. The tank inspector should decide whether the external examination is sufficient or if further examination, including internal examination, is necessary to ensure the continued safe operation of the tank.

53 Signs of degradation that can be detected during a visual external examination include the following:

- bulges;
- discolouration;
- crazes;
- crack-like defects;
- leaning/loss of verticality;
- local wetting of external surfaces; and
- erosion/corrosion of supporting structures and plinths.

54 Inspection should pay particular attention to the following areas:

- area where the tank shell and tank base meet;
- branch and manway attachments; and
- supporting structures of piping and valves.

55 If signs of degradation are noted during routine checks, a competent person should assess the item for continued fitness for service. If the tank is found leaking in service then corrective action should be taken immediately to avoid harm to persons or risk to the environment, and the cause should be investigated by a competent person.

56 Tank inspection regimes should include external examination by a competent person at suitable intervals. An initial external examination by a competent person should take place after a period in service not exceeding one year to inform the ongoing inspection regime where:

- the user has no previous experience of a similar duty tank;
- it is judged that failure could result in a hazardous situation; and
- failure at less than one year has been reported.

57 The competent person's inspection should extend to any vents and overflows and to the foundations and holding down arrangements.

Internal examination

58 Internal examinations should be undertaken by a competent person at appropriate intervals, as determined by the owner and competent person, taking account of inspection history and operational experience. Technical justifications influenced by experience of the same specification tanks in comparable service elsewhere need to be carefully considered to ensure conclusions are soundly based.

59 When making internal examinations of tanks great care should be taken to work safely. Entry into confined spaces should be carefully planned and supervised and should be subject to a strict procedure. Precautions set out in guidance safe work in confined spaces[12] should be rigorously followed. Reference should also be made to guidance on permit-to-work systems, as well as *Safe use of lifting equipment*[11] and *Safe use of work equipment*.[9]

60 Take care during internal examinations to avoid damage to the tank. A means of access should be provided which does not impose unacceptable loadings on the tank or connections. All activity within the tank, eg personnel, use of scaffold, tools etc) should be carefully controlled and performed to prevent danger to personnel or damage to equipment.

61 Where non-destructive examination (NDE) techniques are used to find any defects in the tanks such as cracking, care should be exercised to ensure that any fluids used in these techniques are compatible with the tank material and do not cause deterioration after use. They must also be compatible with the tank contents.

62 The examination report should indicate continued fitness for purpose of the vessel or tank until the next examination date, which should be stated or alternatively indicate any remedial work necessary for continued safe use. A record of the examination findings should be kept for comparison with future findings.

High-consequence equipment

63 Dutyholders operating tanks subject to COMAH 1999 Regulations are required to take all measures necessary to avoid a major accident. This includes adopting good practice using an inspection regime based on a documented scheme of examination. The scheme will specify internal and external examination requirements and will establish the nature, scope and frequency of the examination requirements, including inspection techniques to be used.

64 For new tanks, an outline scheme of examination should be provided by the manufacturer with further details drawn up between the owner and competent person, as appropriate.

65 Items should not be operated beyond their next inspection due date without further inspection in accordance with the scheme of examination, or formal documented deferral by the competent person. Inspection records should be kept for comparison with future inspection findings in order to monitor equipment condition over time.

66 For tanks on hazardous duties it is good practice to undertake an annual external examination carried out by a trained and competent person.

67 All inspections should be recorded and the competent person should issue an examination report indicating continued fitness-for-purpose until the date of next examination (which should be stated) or alternatively indicating remedial work necessary before continued safe use. Inspection results should be compared with previous results to enable identification and monitoring of any active degradation mechanisms.

68 The frequency of routine visual external checks to monitor for early warning signs of degradation and associated recording requirements will need to be determined on a case-by-case basis for items with high failure consequences. As a minimum, monthly routine checks should be carried out with results recorded in line with general good practice.

Inspection techniques

69 Inspection techniques may vary for different tanks and should take account of the contents, operating conditions, materials of construction, design code, and foreseeable failure modes. Visual examination may need to be supplemented by other non-destructive examination (NDE) techniques.

70 NDE methods are not as fully developed for thermoplastic materials as for steel but appropriate methods may assist when performed by suitably qualified and experienced personnel. You should ensure that NDE operatives are suitably qualified, use properly calibrated equipment and follow an appropriate written procedure.

Repairs and modifications

71 Repairs or modifications affecting the integrity of the tank should be carefully considered and the procedures to be followed agreed by the user and competent person. The work should comply with the requirements of relevant design standards. On completion the competent person should certify the tank as fit-for-purpose for continued use within specified safe operating conditions. The implications of the repair or modification for the future scheme of examination should also be considered.

72 Full documentation of all repairs and modifications should be retained with the records for the tank, including full technical details of the materials, techniques, drawings, test certificates, and details of the person who approved the repair/ modification method.

Change of use/second-hand tanks

Change of use

73 During the life of a tank the user may wish to hold substances outside the original specified duty.

74 Any change of use should be properly managed. You should consider factors such as the compatibility of any new substance, or a new concentration of an existing substance, with the thermoplastic material. Calculations may be needed to verify the fill level, making allowance for any increase in the weight of the contents.

75 Thermoplastic material is permeable to some degree to most liquids, gases and vapours. This may present compatibility problems if the tank is considered for a change of use. Permeation/diffusion of the original stored content into the thermoplastic polymer matrix could adversely affect the chemical resistance of the thermoplastic tank to the new content and lead to cross-contamination. It could also cause degradation and early failure of the tank. The manufacturer's literature should be checked and/or the designer or manufacturer contacted to ensure suitability for the new substance.

76 Any departure from the original design conditions must be preceded by an examination by a competent person. The competent person must confirm with the manufacturer and operator that the tank is safe to use under the new conditions.

Second-hand tanks

77 Users who intend to purchase second-hand thermoplastic tanks should satisfy themselves that the proposed tank has been constructed to a suitable standard and is suitable for the proposed new duty.

78 Certificates issued in accordance with the requirements of the relevant standard, design data supplied by the original equipment manufacturer and a full history confirming the operational duty through the life of the tank will normally be needed in order to assess the suitability of the tank, in principle, for a new duty.

79 Where documentation is not available to verify the suitability (in principle) of a tank for the intended duty, under no circumstances should such a tank be used on a potentially hazardous duty.

80 Thermoplastic tanks do not have sufficient strength to cope with duties involving pressure or vacuum conditions and should not be considered for such applications.

81 Second-hand tanks should, in all cases, be examined internally and externally by a competent person to verify fitness for service. The competent person will normally require details of the original specification and duty, operational history including any previous change of use and, for tanks currently out of service, details of storage conditions.

82 The tank should be subjected to the good practice set out in this document, including suitable examination and a hydro test after installation and before use in accordance with the relevant standard.

83 Users who wish to purchase second-hand tanks (or relocate and reuse existing tanks) should satisfy themselves that the consequences of failure are taken into account when deciding whether to use such items. The dutyholder must ensure that measures are taken to manage the risk of failure, in order to prevent harm to persons or the environment. This would include verification of fitness-for-purpose in principle, based on design data, equipment history, compatibility assessment etc, and having suitable measures in place to ensure that the consequences are suitably mitigated in the event of a catastrophic failure.

Appendix 1: Checklist of information exchange between purchaser and manufacturer

Extract from BS EN 12573-1:2000, Section 4 'Design requirements' and subsection 4.1 'General' – The manufacturer shall determine from the purchaser all factors relevant to the design of the tank. A recommended enquiry form for this purpose is given in Annex A.

Annex A (informative)

Questionnaire on conditions of service for a welded, static, non-pressurised, thermoplastic tank.

This is a proposed questionnaire on conditions of service for a welded, static, non-pressurised, thermoplastic tank which should be completed by either the fabricator, the end user or other competent persons.

***Please tick boxes where appropriate and give specific numbers where requested.**

1 Type of construction and dimensions*

a) Circular ☐

b) Rectangular ☐

c) Limiting dimensions ……

d) Maximum filling capacity …… (m^3)

2 Service/operating conditions*

a) Agreed category of tank ……

b) Calculated design life of tank (ten years minimum)

Ten years ☐
25 years ☐
Intermediate time (please state) ☐

c) Range of ambient temperature to be experienced during initial proposed service (please state) …… (ºC)

d) Intended operating temperature …… (ºC)

e) Temperature profile expected during working cycle …… (ºC and time)

f) State if tank will be installed

Internal ☐
External ☐

g) Pressure or vacuum conditions ……

3 Proposed content*

a) Density …… (kj/m^3)

b) Detail constituents by completing the table below

No	Material/ingredient concentration (%)	Proportion of total (%)
1		
2		
3		
4		

c) List of solvents expected

……

d) List of detergents expected

……

4 Additional equipment

Give details of any additional items which will be used in conjunction with the tank, eg agitators, hoppers, air agitators, seal pots, fume scrubbers.

……

……

……

Note 1: The required design life of a tank is the period of time which is used in the determination of the tank dimensions (eg wall thickness) and allowable stresses. It is not the period of warranty. Any warranty needs to be agreed between the customer and the tank fabricator.

Note 2: If the nature of the intended contents of the tanks changes, then it is recommended that the user seeks advice from the manufacturer or other appropriate authorities.

Date …… Signature ……

Name (please print) …… Position ……

Name of company ……

Address ……

……

Tel no. …… Fax no ……

References

1 BS EN 13575:2004 *Thermoplastic tanks made from blow or rotationally moulded polyethylene. Tanks for the above ground storage of chemicals. Requirements and test methods* British Standards Institution

2 BS EN 12573-1:2000 *Welded static non-pressurised thermoplastic tanks. Part 1 General principles* British Standards Institution

3 BS EN 12573-2:2000 *Welded static non-pressurised thermoplastic tanks. Part 2 Calculation of vertical cylindrical tanks* British Standards Institution

4 BS EN 12573-3: 2000 *Welded static non-pressurised thermoplastic tanks. Part 3 Design and calculation for single skin rectangular tanks* British Standards Institution

5 BS EN 12573-4:2000 *Welded static non-pressurised thermoplastic tanks. Part 4 Design and calculation of flanged joints* British Standards Institution

6 BS EN 1778:2000 *Characteristic values for welded thermoplastics constructions. Determination of allowable stresses and moduli for design of thermoplastics equipment* British Standards Institution

7 BS EN 13341:2005 *Thermoplastics static tanks for above ground storage of domestic heating oils, kerosene and diesel fuels. Blow moulded polyethylene, rotationally moulded polyethylene and polyamide 6 by anionic polymerisation tanks. Requirements and test methods* British Standards Institution

8 BS EN 13067:2003 *Plastics welding personnel. Qualification testing of welders. Thermoplastics welded assemblies* British Standards Institution

9 *Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance* L22 (Third edition) HSE Books 2008 ISBN 978 0 7176 6295 1

10 *Storage of dangerous substances. Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance* L135 HSE Books 2003 ISBN 978 0 7176 2200 9

11 *Safe use of lifting equipment. Lifting Operations and Lifting Equipment Regulations 1998. Approved Code of Practice and guidance* L113 HSE Books 1998 ISBN 978 0 7176 1628 2

12 *Safe work in confined spaces. Confined Spaces Regulations 1997. Approved Code of Practice, Regulations and guidance* L101 HSE Books 2009 ISBN 978 0 7176 6233 3

Further reading

Management of health and safety at work. Management of Health and Safety at Work Regulations 1999. Approved Code of Practice and guidance L21 (Second edition) HSE Books 2000 ISBN 978 0 7176 2488 1

A guide to the Control of Major Accident Hazards Regulations 1999 (as amended). Guidance on Regulations L111 HSE Books 2006 ISBN 978 0 7176 6175 6

Design of plant, equipment and workplaces. Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance L134 HSE Books 2003 ISBN 978 0 7176 2199 6

Managing health and safety in construction. Construction (Design and Management) Regulations 2007. Approved Code of Practice L144 HSE Books 2007 ISBN 978 0 7176 6223 4

Leadership for the major hazard industries Leaflet INDG277(rev1) HSE Books 2004 (single copy free or priced packs of 15 ISBN 978 0 7176 2905 3) www.hse.gov.uk/pubns/indg277.pdf

Other useful information

DER 16 Five-year inspection of plastic tanks. New York State Department of Environmental Conservation. Issued September 11 2007.

C598 CIRIA Chemical storage tank systems- good practice. Guidance on design, manufacture, installation, operation, inspection and maintenance.

Institute of petroleum IP13 Pipeline examination

APD Code of Practice HSNOCOP 4-2

Non-metallic storage tanks manufactured prior to 2007. Guidance for operators. CBA/SaFed.

You can get more information at www.hse.gov.uk/comah.

Glossary

Common terms used in this document are as follows.

Thermoplastic	Plastic that can be repeatedly softened by heating and hardened by cooling through a temperature range characteristic of the plastic and, in the softened state, of being shaped by moulding, extruding or forming.
Tank	A container for the storage of liquids subject only to its own hydrostatic head and freely vented to atmosphere.
Pipework	Pipe fittings up to the first isolation valve.
Competent person	A person with enough theoretical and practical knowledge and actual experience of inspection, for example, to detect defects or weaknesses and to assess their importance in relation to the design of a thermoplastic tank.
Approved/ authorised body	A body or association that checks that the design, materials and construction comply with the standard.

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Further information

HSE priced and free publications can be viewed online or ordered from www.hse.gov.uk or contact HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995. HSE priced publications are also available from bookshops.

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This document is available at: www.hse.gov.uk/pubns/guidance/pm86.pdf.