

T19

**DOMESTIC OIL TANK
BASES CONSTRUCTION
AND DESIGN**



**Registration
Services**

Cover Price £10 (ex.VAT and p&p)

(Please note this information sheet is available from the OFTEC website free of charge, www.oftec.org)

1 Introduction

This Technical Document covers Class 1 Domestic Installation only i.e.:-

Oil Tanks for Kerosene not exceeding 3500 litres volume installed at domestic premises.

The need to provide suitable bases and supports for domestic oil storage tanks both of steel and plastic construction is of paramount importance for reasons of both safety and environmental protection. This document aims to give an explanation to the requirements of Building Regulations & British Standard requirements and guidance on the design and construction of oil tank bases as a means to achieve compliant installations.

It is important that the tank manufacturers installation instructions are always complied with.

2 Safety

The Homeowner / end user, Fuel Delivery Driver, Tank Installer and the Service & Commissioning Technician can all be at risk from an inadequately supported oil tank.

An inadequately supported filled tank (especially when raised above ground) poses a very serious safety hazard and threat of injury as a result of a collapse.

Table 1 - Approximate weight of tank.

Tank capacity	Weight of Oil in Tank	Plus total weight of tank and fittings.
1000	790kg	
1500	1185kg	
2000	1580kg	
2500	1975kg	
3000	2367kg	
3500	2765kg	

Based on C2 Kerosene @ 0.79kg/litre
The Building Regulations, Technical Standards & British Standards covering England & Wales, Scotland, Ireland, the Channel Islands and the Isle of Man also

require that fire protection to the stored fuel is provided via the base (a base is defined as the part of the construction in contact with the ground) on (in the case of ground level installations) or above (in the case of raised installations) which the oil tank is installed. The fire protection provided by the base, is to help prevent the installation itself from becoming overgrown and to help protect against fire spread, across ground, to the stored fuel from another source.

Types of base materials, as listed in British Standards & Building Regulations to achieve this protection, includes concrete of at least 100mm thickness, paving stones of at least 42 mm thickness or stonework of at least 42mm thickness (all laid to give an imperforate base). The overall size of the base should be larger than the tank and any integral tank bund, so that when the tank is installed, the base has a clear projection of a minimum of 300mm around all sides of the tank. See Site Layout Drawing T19/01.

In exposed sites, and in particular when the tank is on piers, it is recommended to provide anchorage stays to give stability for when the tank contains small quantities of fuel i.e. when the tank is light.

3 Environment

To protect the environment oil storage systems must be installed with due reference to the tank manufacturers installation instructions and suitably protected from any potential mechanical damage.

If an oil tank moves because it is inadequately supported, it can lead to leakage of fuel from connection joints at the tank and in the supply line itself.

If an oil tank is inadequately supported the tank itself can be weakened leading to the eventual failure of the tank and escape of the stored fuel.

4 Performance

Tank bases and supports which may initially appear to be suitable for the purpose required of them, need to be constructed to last at least the life of the tank which can be

circa 20 years. During this period of time the ground conditions can and do change, trees which once removed moisture from the surrounding ground may be cut down or fast growing Leylandii may be planted where there was none and may surprisingly quickly remove moisture from the surrounding ground. Water tables rise and fall, the ground freezes and thaws, summer droughts and winter snows can all have an effect.

As a result of this a one-piece concrete base cast in-situ will usually have the least risk of allowing the tank to move and where necessary steel mesh can also be added to give additional protection where poor ground conditions and point loads from brick or block piers exist. However with suitable account being taken of ground conditions and site preparation, groundworks can achieve a stable platform on to which precast lintels or paving slabs can be installed to achieve a suitable level of performance.

5 Ground Types

It is important to establish the stability of the ground to determine the thickness of the compacted hardcore.

Bases constructed of paving slabs will require a more substantial compacted hardcore sub-base due to the increased potential of movement.

To enable identification of subsoil “ground types” the following field or site ‘Heel Test’ is given.

Heel Test

Remove the top vegetated soil layer until the proposed level for the addition of hardcore is reached. A full-grown man is then to stand on one leg on the heel of one foot on the exposed soil layer. The man then steps off and inspects whether or not any imprint is made.

The results of the test should be compared to the following table to determine the recommended minimum thickness of compacted hardcore.

All hardcore must be compacted using a wacker plate.

Table 2 - Heel Test for paving slab bases

Subsoil	Heel Test result	Recommended minimum thickness of compacted hardcore
Rock	No heel print	150mm
Firm	No heel print	200mm
Soft	1mm heel print	300mm
Very Soft	Deep heel print	See note below

Note ‘Very Soft’ subsoil conditions are not suitable for bases constructed of paving slabs.

Table 3 - Heel Test for cast concrete bases

Subsoil	Heel Test result	Recommended minimum thickness of compacted hardcore
Rock	No heel print	100mm
Firm	No heel print	100mm
Soft	1mm heel print	200mm
Very Soft	Deep heel print	300mm

Table 4 - Heel Test for precast lintel bases

Subsoil	Heel Test result	Recommended minimum thickness of compacted hardcore
Rock	No heel print	100mm
Firm	No heel print	100mm
Soft	1mm heel print	200mm
Very Soft	Deep heel print	See note below

Note ‘Very Soft’ subsoil conditions are not suitable for bases constructed of precast lintels.

6 Drawings

6.1 General Site Layout Dimensions

Figure T19/1 shows a typical example for guidance to the specifier for submissions to Building Control for Class 1 Domestic Installation.

In this example a plastic tank is shown on a platform that fully supports the whole of the underside of the tank. The platform is raised by piers on a base constructed from precast concrete lintels laid on level compacted hardcore.

The minimum size of the base is calculated

from the overall length (or diameter) of the tank + 300mm at each end and the width of the tank + 300mm at each side.

The drawings also show the relationship between a boundary and tank position.

For further details of Oil Tank Fire Protection including separation from buildings refer to OFTEC Technical Information Sheets T13 (TI/131) Class 1 Domestic & T15 (TI/136) for Classes 2 & 3 Non - Domestic.

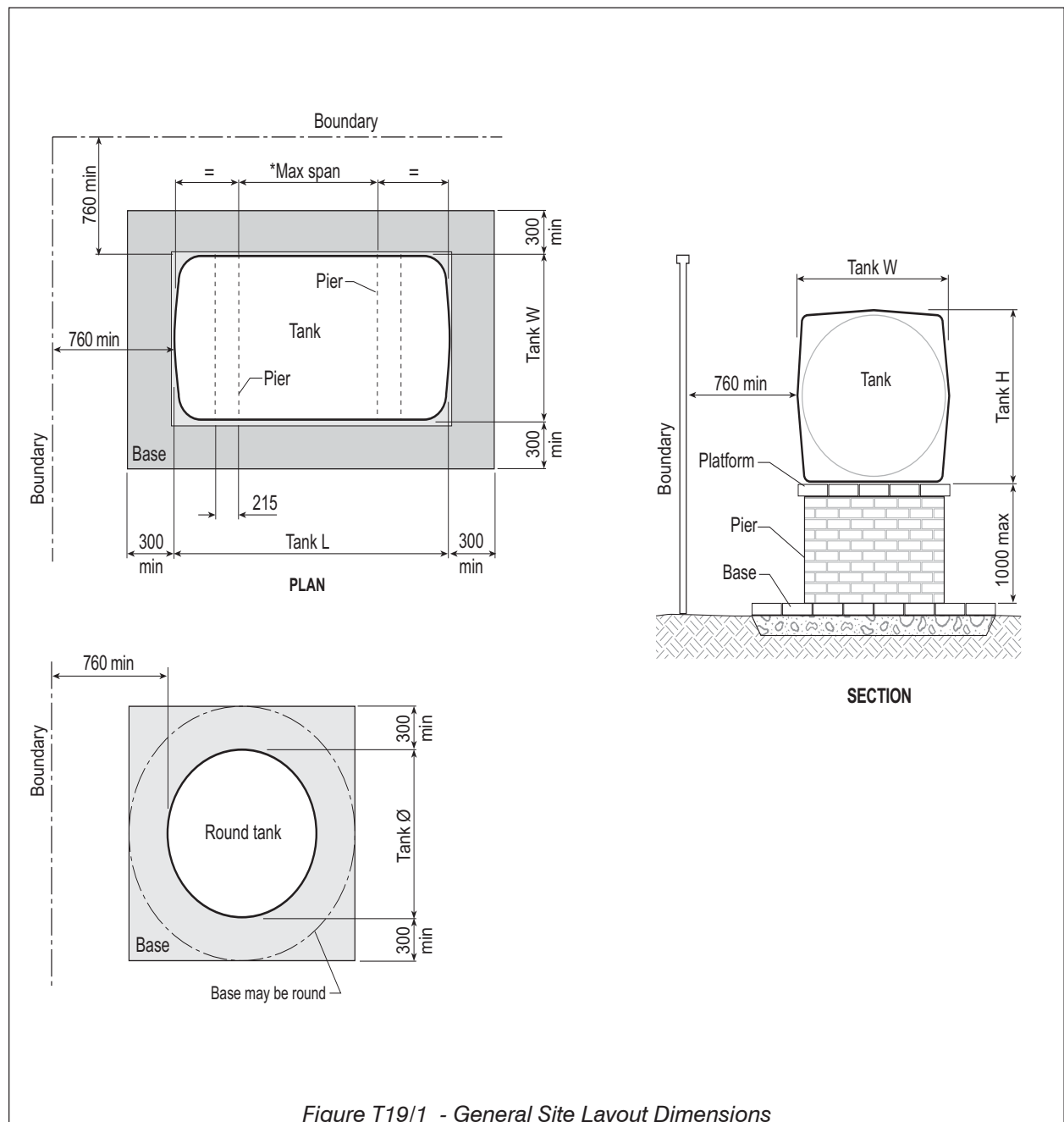


Figure T19/1 - General Site Layout Dimensions

6.2 Plastic Tank on Concrete Base

Figure T19/2 shows a top outlet plastic tank positioned at ground level on a concrete base.

Bottom outlet tanks may need to be raised on a platform for the maintenance of filter units and fittings located at the tank outlet - see figures T19/7 and 8.

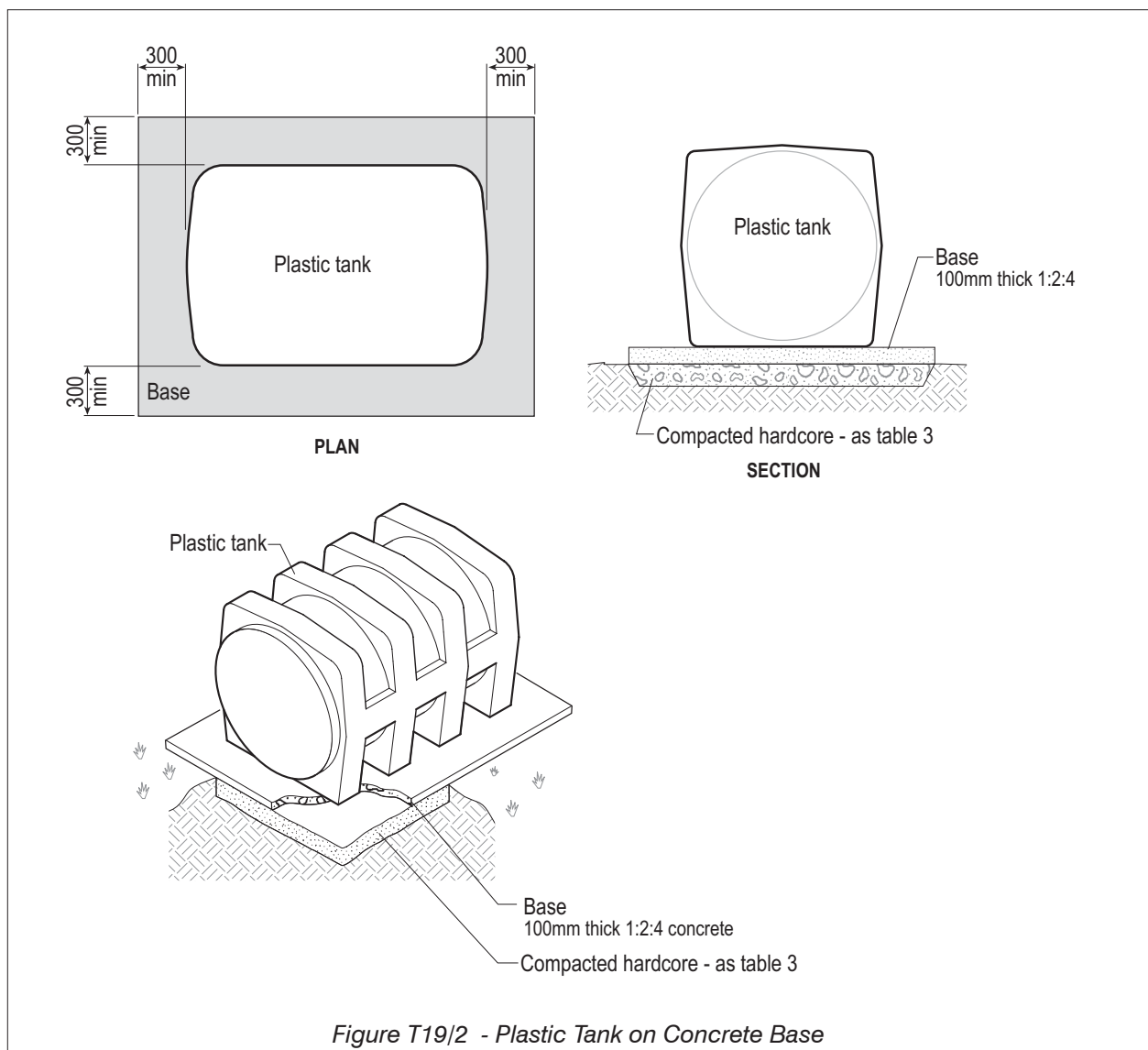
6.2.1 Base

Constructed from 100mm minimum thickness concrete base laid on top of 100mm minimum of compacted hardcore to ensure a stable base - see table 3.

When poor site/ground conditions exist A142 steel mesh should be incorporated as reinforcement.

Note

This arrangement is not suitable for steel tanks as corrosion to the base of the tank will occur.



6.3 Plastic Tank on Precast Lintels

Figure T19/3 shows a top outlet plastic tank positioned at ground level on a precast concrete lintel base.

Bottom outlet tanks may need to be raised on a platform for the maintenance of filter units and fittings located at the tank outlet - see figures T19/7 and 8.

minimum of compacted hardcore to ensure a stable base - see table 4.

This method of base construction has abutted linear joints and therefore may not be suitable where very soft ground conditions are evident - see table 4.

6.3.1 Base

Constructed from tightly abutted 65mm x 215mm precast concrete lintels to BS5977 (as commonly used in the construction industry) to create an impermeate base. Lintels should be laid on top of 100mm

Note

This arrangement is not suitable for steel tanks as corrosion to the base of the tank will occur.

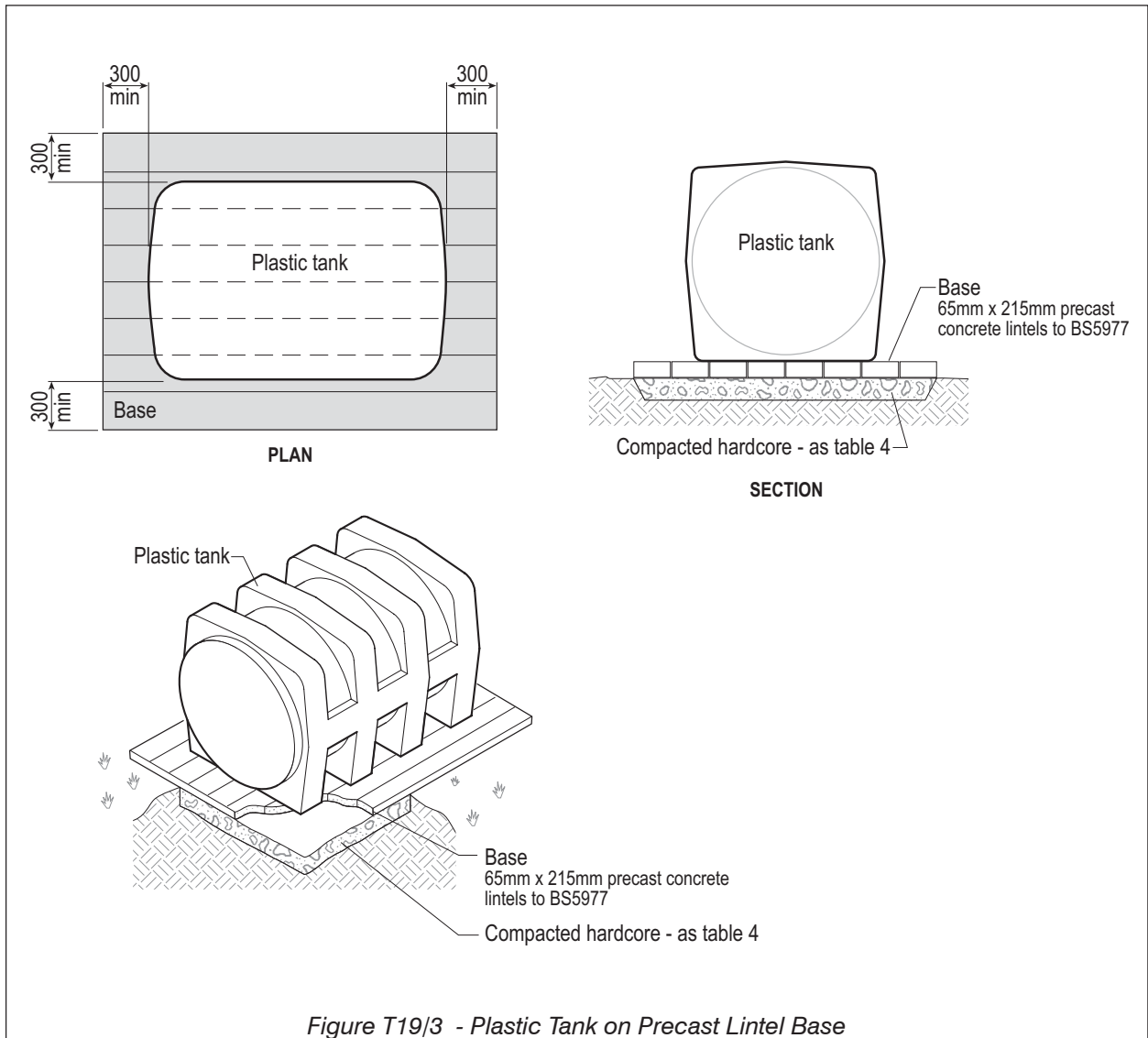


Figure T19/3 - Plastic Tank on Precast Lintel Base

6.4 Plastic Tank on Paving Slabs

Figure T19/4 shows a top outlet plastic tank positioned at ground level on a precast paving slab base.

Bottom outlet tanks may need to be raised on a platform for the maintenance of filter units and fittings located at the tank outlet - see figures T19/7 and 8.

6.4.1 Base

Constructed from tightly abutted 900mm x 600mm x 50mm thick precast concrete paving slabs to create an impermeable base. The use of smaller slabs although permitted can lead to an increased risk of movement. Paving slabs should be laid on top of 150mm minimum of level compacted hardcore to ensure a stable base - see table 2.

Where soft soil conditions are evident then 300mm of compacted hardcore should be used.

This method of base construction has abutted joints across the length and breadth of the base and therefore may not be suitable where very soft ground conditions are evident - see table 2.

Bases constructed from paving slabs are not deemed to be suitable for tanks raised on piers.

Note

This arrangement is not suitable for steel tanks as corrosion to the base of the tank will occur.

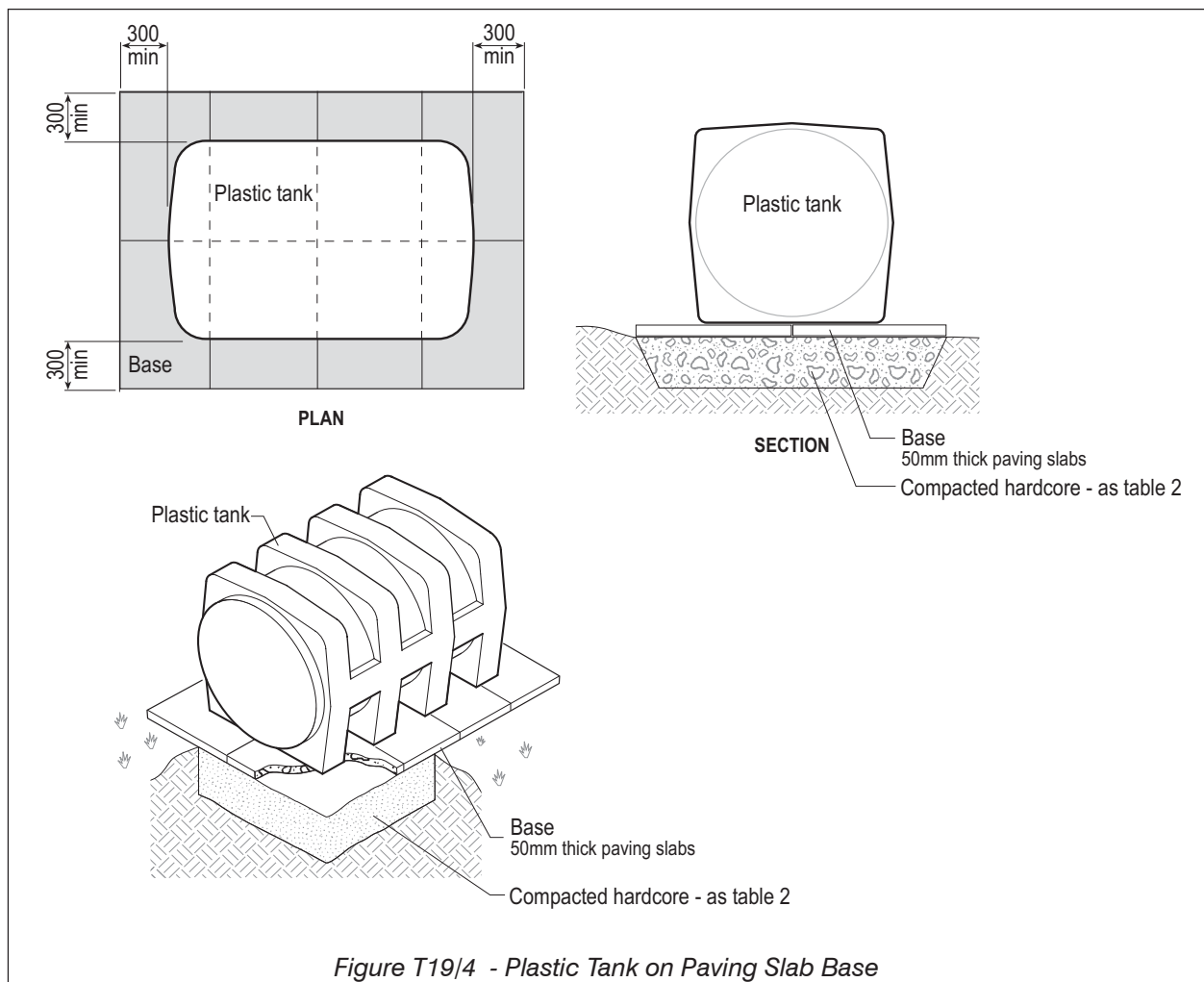


Figure T19/4 - Plastic Tank on Paving Slab Base

6.5 Steel Tank on Piers with Concrete Base

Figure T19/5 shows a typical Steel Tank raised on piers with a concrete base.

6.5.1 Base

Constructed from 100mm minimum thickness concrete base laid on top of 100mm minimum of compacted hardcore to ensure a stable base - see table 3.

Minimum concrete mix specification of 1:2:4.

It is recommended to incorporate A142 steel mesh reinforcement to provide stability at the load points created by the piers.

6.5.2 Piers

The piers should be a minimum of 215mm thick brick or block with joints mortar jointed together and be spaced in accordance with the table shown dependant on the bottom plate thickness of the tank.

Piers should extend just beyond the width of the tank to allow the loading to be transferred through the side plates of the tank.

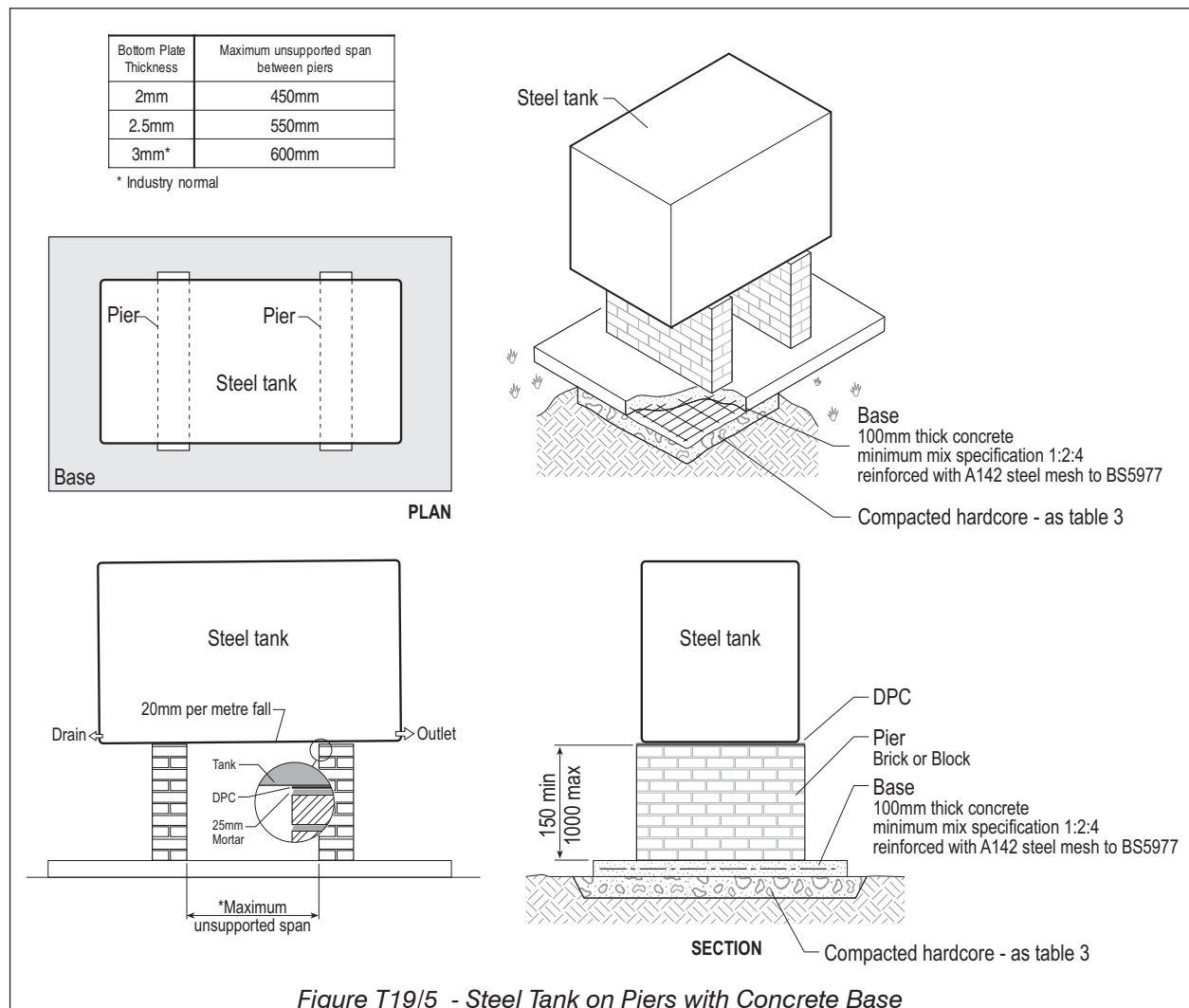
The top of the piers should be finished with a 25mm thick mortar bedding, then a damp-proof membrane (DPC) onto which the tank is placed.

The maximum height shown for piers in this document is 1m.

Minimum height of the piers is 150mm thus allowing relatively low level steel tank installations to be created.

The 150mm minimum dimension enables:-

1. Air movement around the tank to help prevent corrosion.
2. Visible routine inspection of the underside of the tank to be made.
3. Routine maintenance and servicing of oil filters when fitted at the tank outlet.
4. The tank to be raised above the base to reduce exposure to rain splash.





6.5.3 Tank Fall

The piers should create a fall from the outlet end to the rear of the tank of approximately 20mm fall per metre length of tank.

This fall creates a trap at the rear of the tank for sediment and condensation to accumulate which can be periodically removed via a sludge cock or valve.

Integrally banded steel oil tanks with inbuilt means of sludge and contaminate removal, may not require a fall to be provided. For further information please refer to the tank manufacturers installation instructions.

6.6 Steel Tank on Piers with Lintel Base

Figure T19/6 shows a typical Steel Tank raised on piers with a precast lintel base.

6.6.1 Base

Constructed from tightly abutted 65mm x 215mm precast concrete lintels to BS5977 (as commonly used in the construction industry) to create an impermeate base. Lintels should be laid on top of 100mm minimum of compacted hardcore to ensure a stable base - see table 4.

This method of base construction has abutted linear joints and therefore may not be suitable where very soft ground conditions are evident - see table 4.

6.6.2 Piers

The piers should be a minimum of 215mm thick brick or block with joints mortar jointed together and be spaced in accordance with the table shown dependant on the bottom plate thickness of the tank.

Piers should extend just beyond the width of the tank to allow the loading to be transferred through the side plates of the tank.

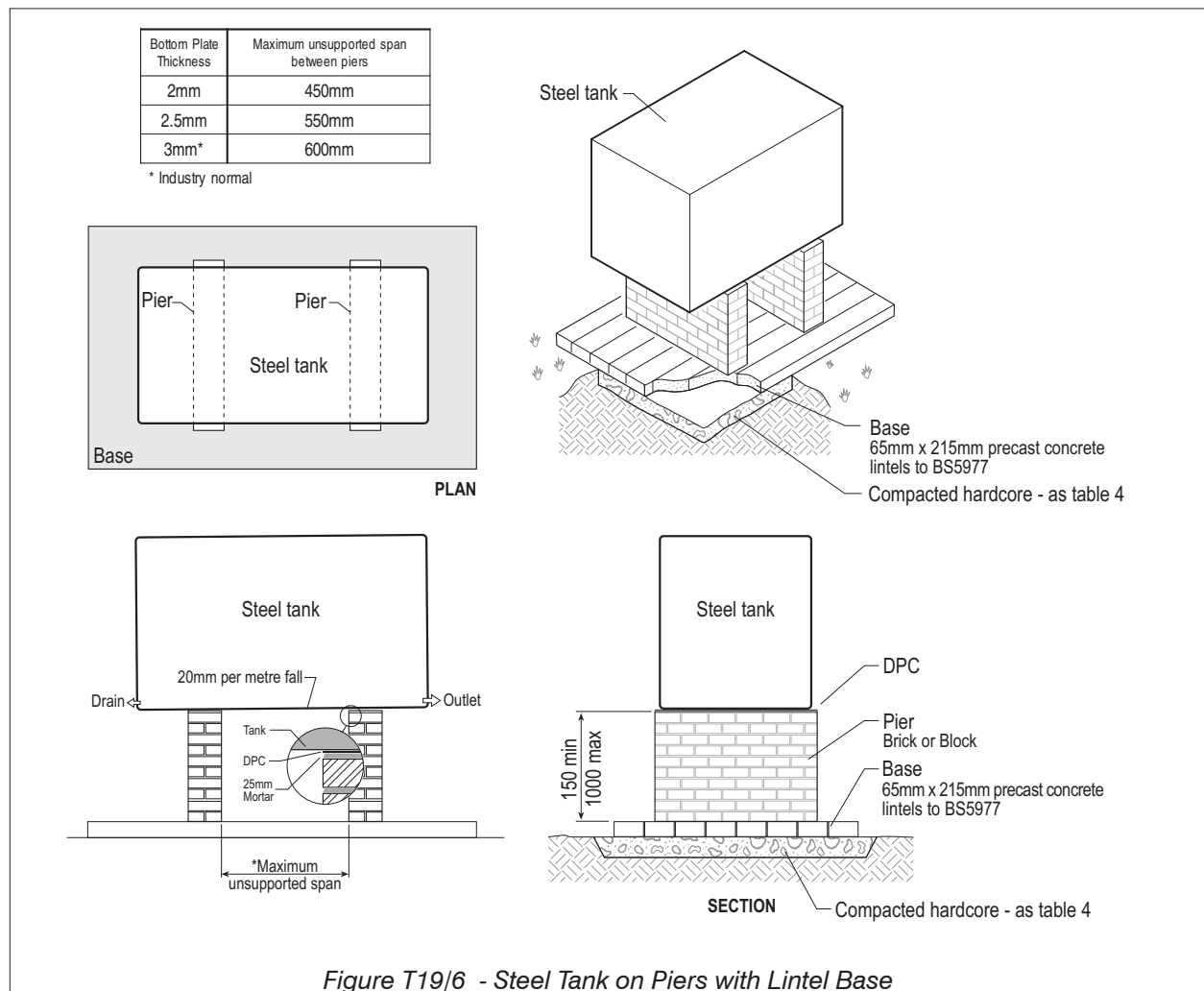
The top of the piers should be finished with a 25mm thick mortar bedding, then a damp-proof membrane (DPC) onto which the tank is placed.

The maximum height shown for piers in this document is 1m.

Minimum height of the piers is 150mm thus allowing relatively low level steel tank installations to be created.

The 150mm minimum dimension enables:-

1. Air movement around the tank to help prevent corrosion.
2. Visible routine inspection of the underside of the tank to be made.
3. Routine maintenance and servicing of oil filters when fitted at the tank outlet.
4. The tank to be raised above the base to reduce exposure to rain splash.





6.6.3 Tank Fall

The piers should create a fall from the outlet end to the rear of the tank of approximately 20mm fall per metre length of tank.

This fall creates a trap at the rear of the tank for sediment and condensation to accumulate which can be periodically removed via a sludge cock or valve.

Integrally banded steel oil tanks with inbuilt means of sludge and contaminate removal may not require a fall to be provided. For further information please refer to the tank manufacturers installation instructions.

6.7 Plastic Tank on Platform with Concrete Base

Figure T19/7 shows a vertical bottom outlet Plastic Tank raised on a platform with a concrete base.

6.7.1 Base

Constructed from 100mm minimum thickness concrete base laid on top of 100mm minimum of compacted hardcore to ensure a stable base - see table 3.

Minimum concrete mix specification of 1:2:4.

It is recommended to incorporate A142 steel mesh reinforcement to provide stability at the load points created by the piers.

6.7.2 Piers

The piers should be a minimum of 215mm thick brick or block with joints mortar jointed together and be spaced so that the overhang at either end of the platform should not exceed half of the distance between the piers.

Piers should extend just beyond the width of the tank to allow full support to the platform.

The top of the piers should be finished with a 25mm thick mortar bedding onto which the platform is placed.

The maximum height shown for piers in this document is 1m.

The minimum height of the piers should be sufficient to enable routine maintenance and servicing of oil filters when fitted at the tank outlet.

6.7.3 Platform

Constructed from tightly abutted 65mm x 215mm precast concrete lintels to BS5977 (as commonly used in the construction industry) to create an imperforate support to the whole of the underside of the tank.

It is important that no part of the base (bottom) of the tank overhangs the platform as the strength of the tank may be impaired.

The platform should normally be level.

For information on integrally banded oil tanks with inbuilt means of sludge and contaminate removal refer to the tank manufacturers installation instructions.

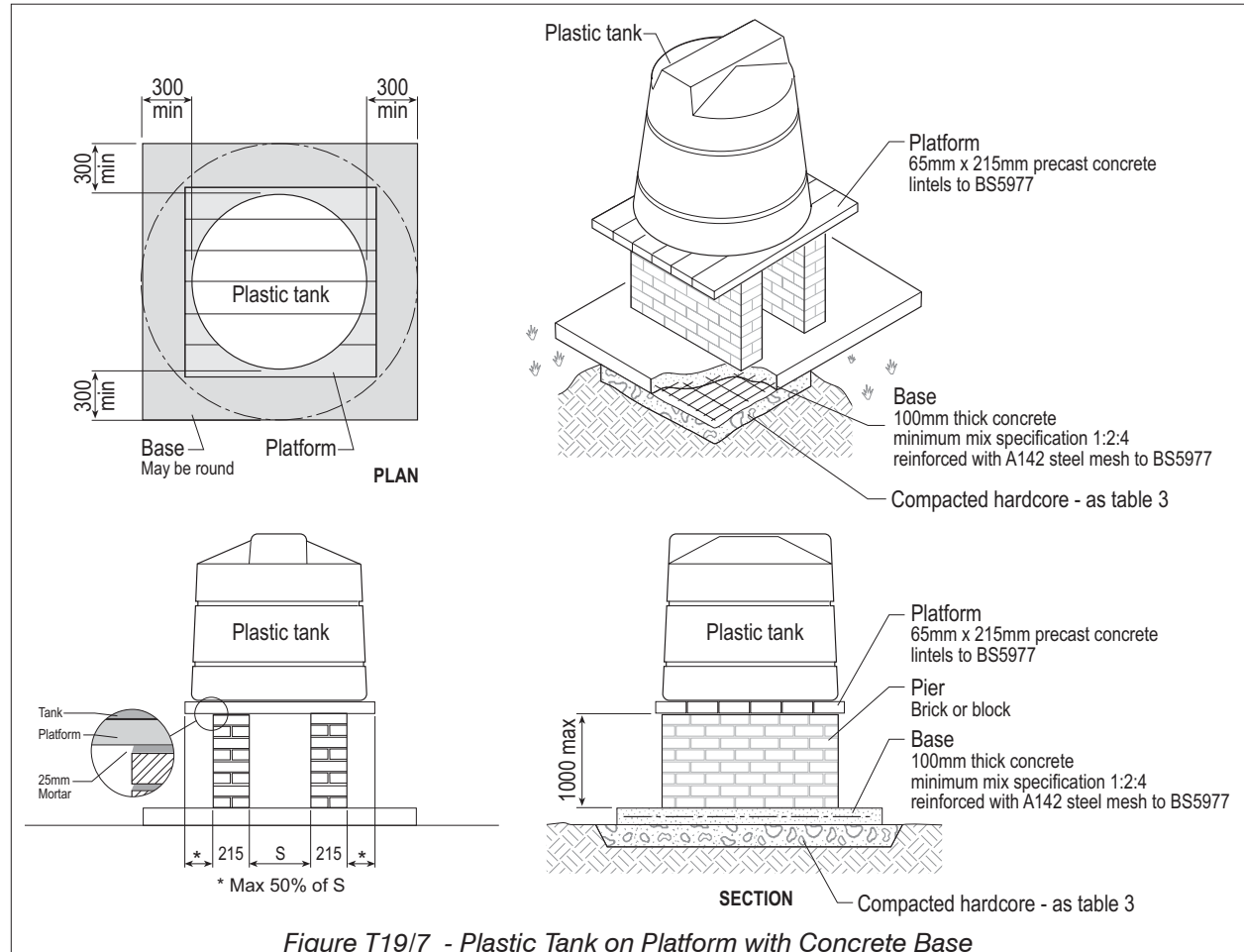


Figure T19/7 - Plastic Tank on Platform with Concrete Base

6.8 Plastic Tank on Platform with Lintel Base

Figure T19/8 shows a typical bottom outlet Plastic Tank raised on a platform with a precast concrete lintel base.

6.8.1 Base

Constructed from tightly abutted 65mm x 215mm precast concrete lintels to BS5977 (as commonly used in the construction industry) to create an imperforate base. Lintels should be laid on top of 100mm minimum of compacted hardcore to ensure a stable base - see table 4. This method of base construction has abutted linear joints and therefore may not be suitable where very soft ground conditions are evident - see table 4.

6.8.2 Piers

The piers should be a minimum of 215mm thick brick or block with joints mortar jointed together and be spaced so that the overhang at either end of the platform should not exceed half of the distance between the piers.

Piers should extend just beyond the width of the tank to allow full support to the platform. The top of the piers should be finished with a 25mm thick mortar bedding onto which the platform is placed.

The maximum height shown for piers in this document is 1m.

The minimum height of the piers should be sufficient to enable routine maintenance and servicing of oil filters when fitted at the tank outlet.

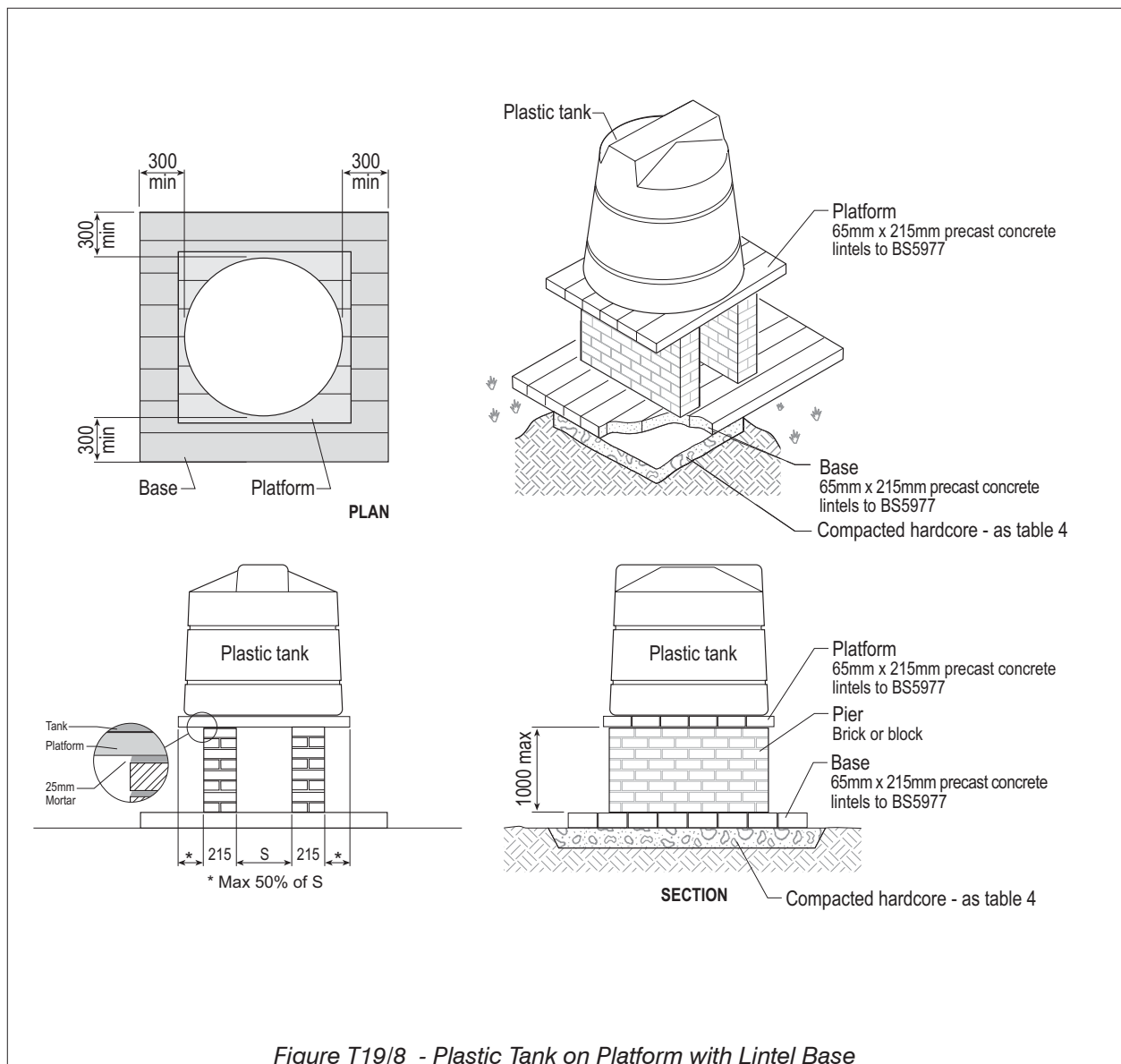


Figure T19/8 - Plastic Tank on Platform with Lintel Base

6.8.3 Platform

Constructed from tightly abutted 65mm x 215mm precast concrete lintels to BS5977 (as commonly used in the construction industry) to create an imperforate support to the whole of the underside of the tank.

It is important that no part of the base (bottom) of the tank overhangs the platform as the strength of the tank may be impaired.

The platform should normally be level.

For information on integrally banded oil tanks with inbuilt means of sludge and contaminate removal refer to the tank manufacturers installation instructions.

7 Additional Information

For additional information regarding the installation of oil storage and supply systems please visit www.oftec.org and download copies of the other Technical Information Sheets in the series.

For details of the manufacturers of oil firing equipment including oil storage tanks and associated equipment please visit the OFTEC website www.oftec.org and download a copy of the OFTEC Equipment Directory.

For details of OFTEC Registered Installers of Oil Firing Equipment and OFTEC Registered Service and Commissioning Technicians please visit the OFTEC website www.oftec.org where you can locate technicians who work in your area.

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