Below Ground Tanks

INSTALLATION OF BELOW GROUND TANKS

General Requirements

For details of excavations refer to section **4.18**, where an excavation check list is provided which outlines good practice.

Once a site survey has been completed, and the ground conditions in the proposed location identified. Calor should be provided with a copy of all the information to ensure the conditions are suitable for below ground LPG storage. No further work should be carried out before Calor have agreed suitability.

Close liaison with Calor should be maintained throughout the groundwork operations. Calor may require an inspection of the excavation prior to tank installation.

The dimensions given are the minimum required to locate and install the tank with all associated equipment. They should not be taken as the actual size of the excavation, which may vary with location, as well as ground conditions etc., which must be determined by a competent civil contractor.

The tank will be supplied with pre-cast anchor blocks, unless a concrete base has been cast on site, and installed by Calor, complete with all fittings, anodes and connection of service pipework. A perforated yellow plastic sheet warning mesh will be supplied, for installation by groundwork contractor at the appropriate depth, during the backfilling operation.

Type 227 (2100 litre) tanks are supplied as standard unless otherwise specified.

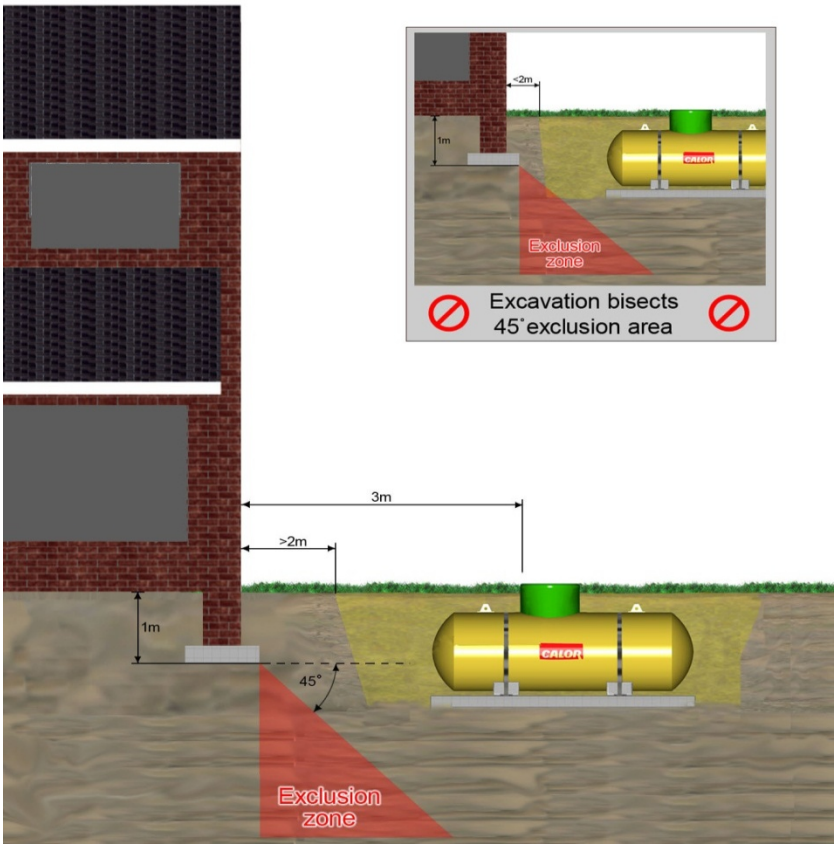


Figure 4.17.1 – **Installation of a 2100 Litre Below ground tank showing the minimum siting distances from building foundations or structures**

Below Ground Tanks

SEMI-MOUNDED INSTALLATION (SINGLE TANK PRE-CAST ANCHOR BLOCKS)

The following details are for the installation of Calor 2100 Litre and 4000 Litre Semi-mounded below ground tanks using Calor Pre-Cast anchor blocks only.

Dimensions shown are minimum to the bottom of the excavation (E).

The top of the tank must be at least 100mm above the natural ground level.

When grading the backfill material the depth of cover over ALL parts of the tank shell, must nowhere be less than 300mm deep from the finished surface, after settlement.

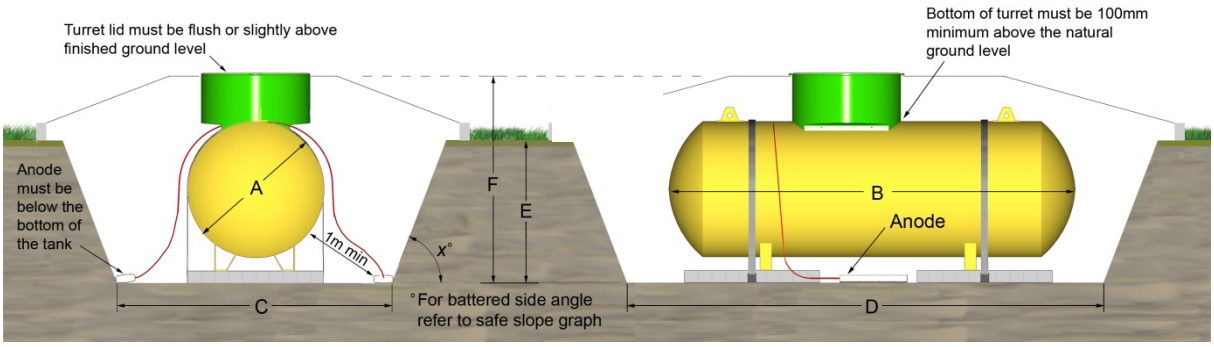


Fig 4.17.2 – **Excavation criteria for semi-mounded installation**

Depending on the finished angle of the grading from around the top cover, a retaining wall with provision of self-drainage must be installed on all four sides to prevent erosion of the top soil and reduction of the 300 mm protective cover.

Table 4.17.1 – Excavation dimensions (semi mounded) using pre-cast anchor blocks

SEMI MOUNDED BELOW GROUND TANK EXCAVATION DIMENSIONS **(Using Calor pre-cast anchor blocks)**			
		2100 Litre Type 227	**4000 Litre Type 418**
Diameter of tank	A	1200mm	1200mm
Length of tank	B	2466mm	4400mm
Minimum width of excavation (at bottom)	C	2700mm	2700mm
Minimum length of excavation (at bottom)	D	3720mm	5600mm
Depth of excavation	E	1620mm	1740mm
Height of tank	F	1700mm	1700mm
Pre-Cast block height	-	120mm	240mm

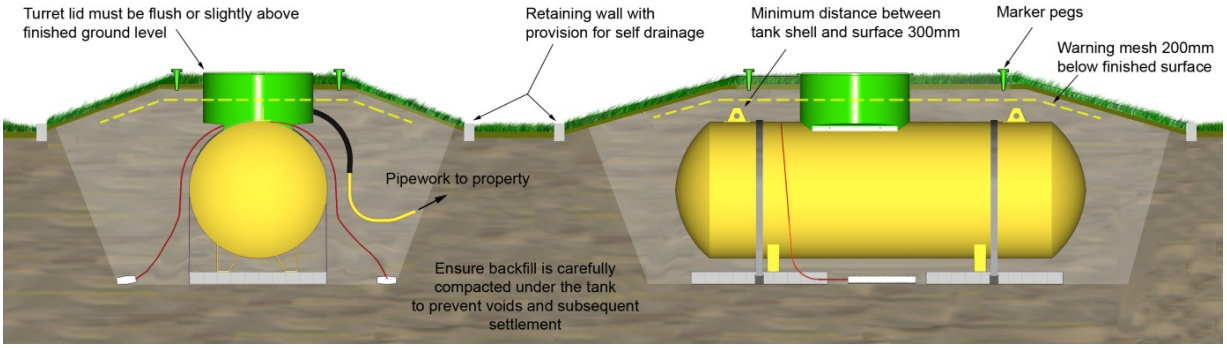


Figure 4.17.3 – **Reinstatement criteria for semi-mounded installation**

Below Ground Tanks

LEVEL GROUND INSTALLATION (SINGLE TANK PRE-CAST ANCHOR BLOCKS)

The following details are for the installation of Calor 2100 and 4000 litre below ground tanks using Calor Pre-Cast anchor blocks only.

Dimensions shown are minimum to the bottom of the excavation (E).

For clay type or water retaining soils to prevent flooding of the turret, it may be required to install drain tubes from the low points either side of the turret to a soak-away pit filled with hard core rubble, etc. The top of the soak-away must be at the depth (E) shown in the diagram.

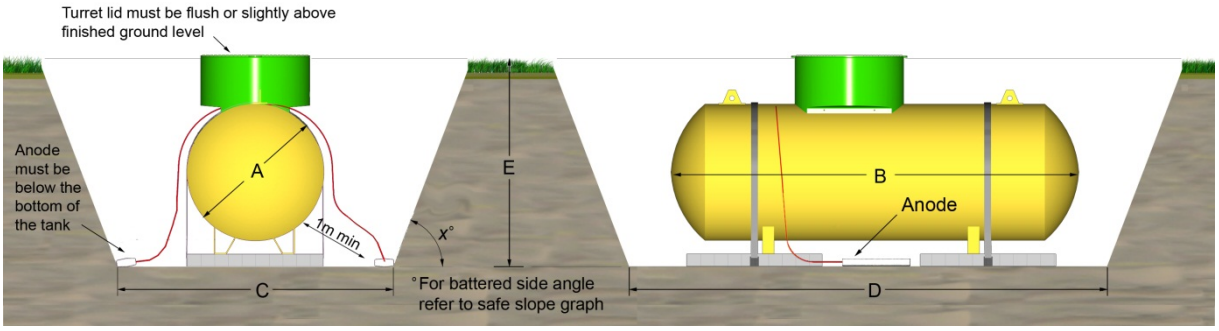


Figure 4.17.4 – Excavation Criteria

Table 4.17.2 – Excavation dimensions using pre cast anchor blocks for level ground installation

BELOW GROUND TANK EXCAVATION DIMENSIONS **(Using Calor pre-cast anchor blocks)**		**2100 Litre Type 227**	**4000 Litre Type 418**
Diameter of tank	A	1200mm	1200mm
Length of tank	B	2466mm	4400mm
Minimum width of excavation (at bottom)	C	2700mm	2700mm
Minimum length of excavation (at bottom)	D	3720mm	5600mm
Depth of excavation	E	1800mm	1920mm
Height of tank	-	1700mm	1700mm
Pre-Cast block height	-	120mm	240mm

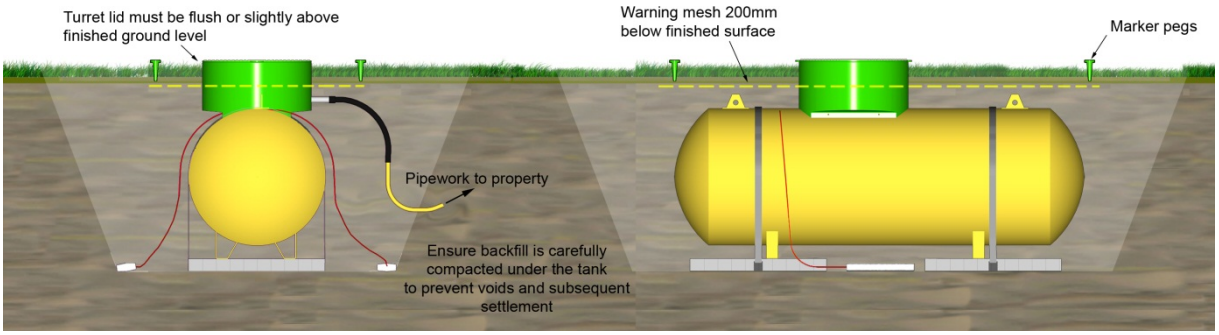


Figure 4.17.5 – Reinstatement criteria

Below Ground Tanks

GRADED LANDSCAPE INSTALLATION (SINGLE TANK PRE-CAST ANCHOR BLOCKS)

The following details are for the installation of Calor 2100 Litre and 4000 Litre below ground tanks using Calor Pre-Cast anchor blocks only.

Dimensions shown are minimum to the bottom of the excavation (E).

For clay type or water retaining soils to prevent flooding of the turret, it may be required to install drain tubes from the low points either side of the turret to a soak-away pit filled with hard core rubble, etc. The top of the soak-away must be at the depth (E) shown in the diagram.

The tank turret must be flush or slightly above the finished ground level and the backfill carefully graded to ensure rain water will not accumulate around the tank turret.

When grading the backfill material the depth of cover over ALL parts of the tank shell, must nowhere be less than 300mm deep from the finished surface, after settlement.

Depending on the finished angle of the grading from around the top cover, a retaining wall with provision for self-drainage may need to be installed on the graded sides to prevent erosion of the top soil and reduction of the 300mm protective cover.

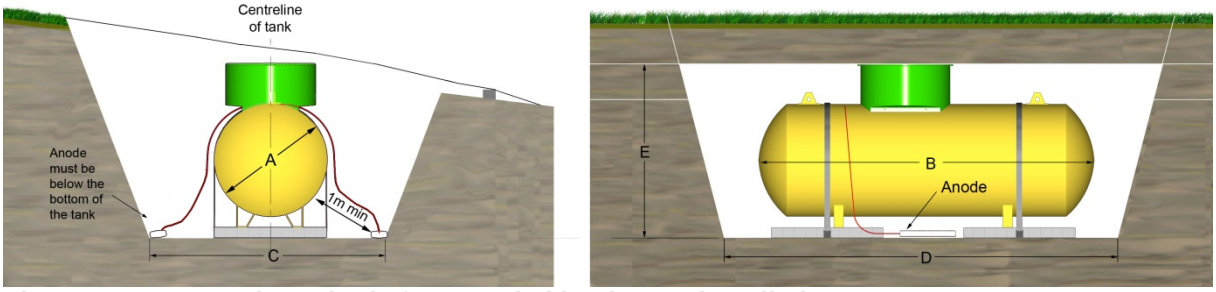


Fig 4.17.6 – **Excavation criteria for a graded landscape installation**

Table 4.17.3 – Excavation dimensions (graded landscape) using pre-cast anchor blocks

BELOW GROUND TANK EXCAVATION DIMENSIONS **(Using Calor pre-cast anchor blocks)**		**2100 Litre Type 227**	**4000 Litre Type 418**
Diameter of tank	A	1200mm	1200mm
Length of tank	B	2466mm	4400mm
Minimum width of excavation (at bottom)	C	2700mm	2700mm
Minimum length of excavation (at bottom)	D	3720mm	5600mm
Depth of excavation	E	1800mm	1920mm
Height of tank	-	1700mm	1700mm
Pre-Cast block height	-	120mm	240mm

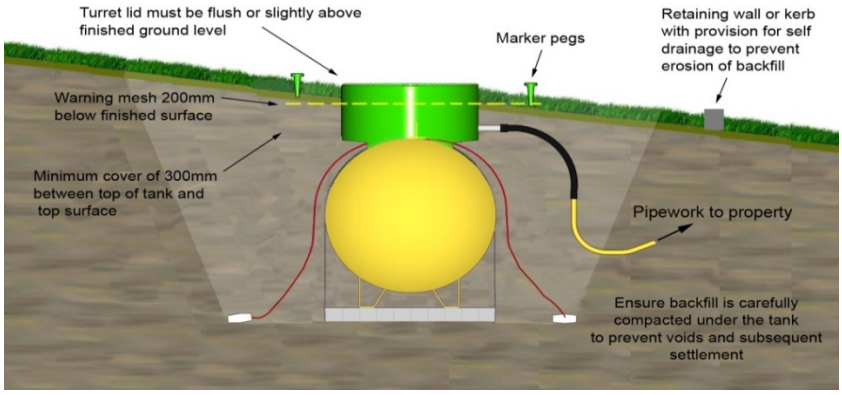


Fig 4.17.7 – Reinstatement criteria for a graded landscape installation

Below Ground Tanks

EXCAVATION AND GROUNDWORK DETAILS FOR CUSTOMER CAST BASES (MULTIPLE TANKS)

The following details are for the installation of Calor 2100 and 4000 Litre below ground tanks using Customer Cast Bases only.

All drawings shown are not to scale and dimensions quoted are the minimum required.

Dimensions shown are minimum to the bottom of the excavation (E).

For clay type or water retaining soils to prevent flooding of the turret, it may be required to install drain tubes from the low points either side of the turret to a soak-away pit filled with hard core rubble, etc. The top of the soak-away must be at the depth (E) shown in the diagram.

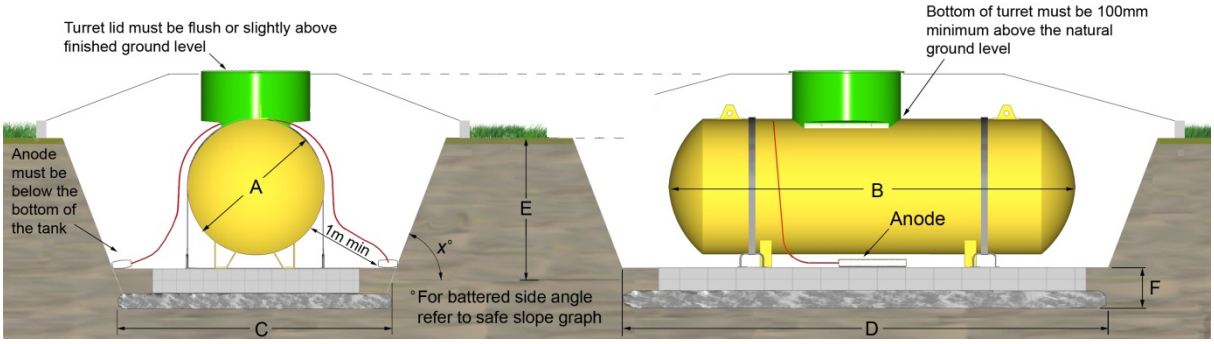


Figure 4.17.8 – Excavation criteria for semi-mounded installation

Calor recommend a 300mm thick concrete base with 150mm of compacted hard-core. If, due to local ground conditions, the customer's civil contractor determines a different base or hard-core thickness, the depth of the excavation F shall be modified accordingly.

Table 4.17.4 – Semi mounded below ground tank excavation dimensions

SEMI MOUNDED BELOW GROUND TANK EXCAVATION DIMENSIONS **(Using customer cast base)**			
		2100 Litre Type 227	**4000 Litre Type 418**
Diameter of tank	A	1200mm	1200mm
Length of tank	B	2466mm	4400mm
Minimum width of excavation (at bottom)	C	**See table 4.17.6**	
Minimum length of excavation (at bottom)	D		
Depth of excavation to top of base	E	1500mm	1500mm
Base thickness	F	300mm plus 150mm hardcore	

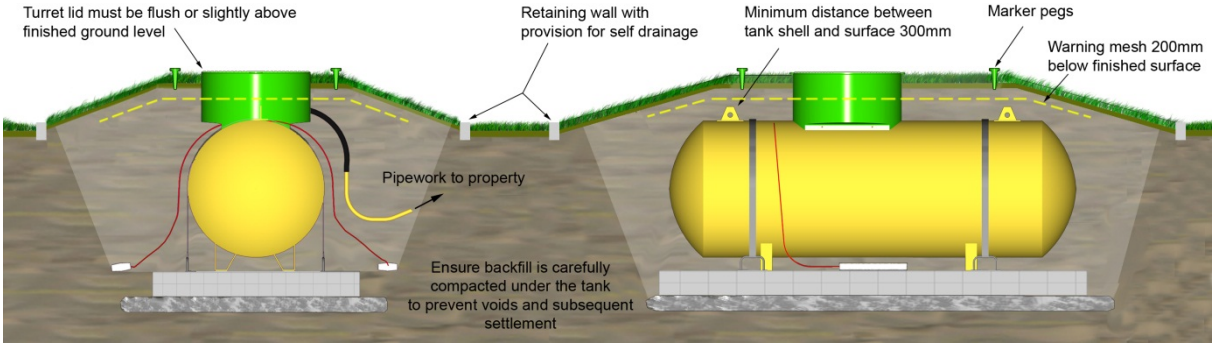


Figure 4.17.9 – Reinstatement criteria for semi-mounded installation

Below Ground Tanks

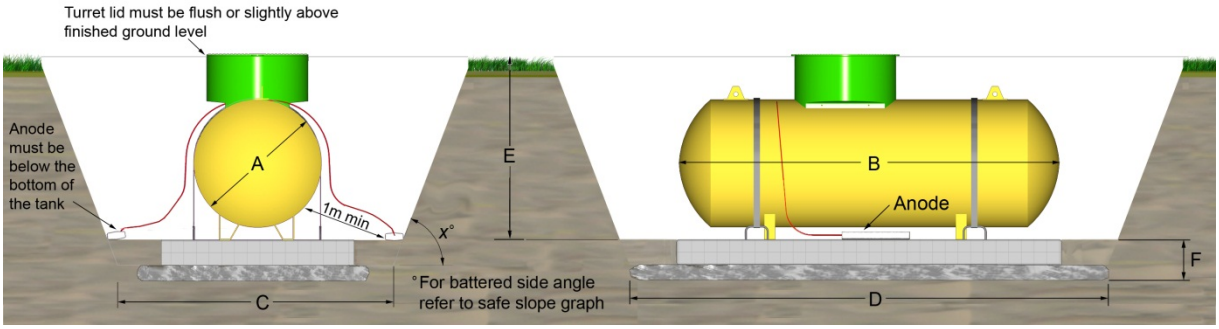


Figure 4.17.10 – **Below ground dimensions for installations using a customer cast base**

Table 4.17.5 – Excavation dimensions using customer cast base

BELOW GROUND TANK EXCAVATION DIMENSIONS **(Using customer cast base)**		**2100 Litre Type 227**	**4000 Litre Type 418**
Diameter of tank	A	1200mm	1200mm
Length of tank	B	2466mm	4400mm
Minimum width of excavation (at bottom)	C	**See table 4.17.6**	
Minimum length of excavation (at bottom)	D		
Depth of excavation to top of base	E	1680mm	1680mm
Base thickness	F	300mm plus 150mm hardcore	

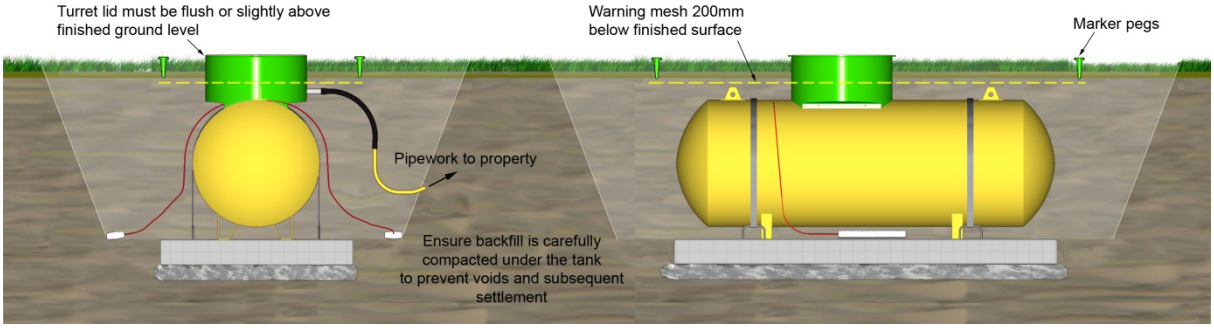


Figure 4.17.11 – Reinstatement criteria for customer cast bases

Table 4.17.6 – Multi-tank Excavation dimensions using customer cast base

MULTI -TANK EXCAVATION DIMENSIONS **(For Customer Cast Bases)**				
Tank Size (Litres)	Tank Configuration	Number of Tanks	Excavation Dimensions (mm)	
			Minimum Width (C)	Minimum Length (D)
2100	Side by Side	2	5200	3800
		3	7400	3800
	End on End	2	3000	7186
4000	Side by Side	2	5200	5700
		3	7400	5700
		4	9600	5700
		5	11800	5700
		6	14000	5700
	End on End	2	3000	11200
	Two by Two	4	5200	11200
	Three by Two	6	7400	11200

Below Ground Tanks

Base Dimensions and Anchor Points

Tank(s) will be supplied and installed by Calor.

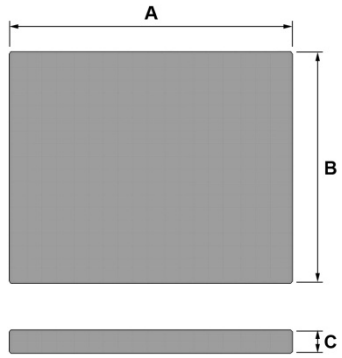
Hardcore (type 1) is to cover the base of the excavation with a compacted depth of 150mm.

Anchor points shall be provided by Calor and must be attached to the base reinforcing mesh to prevent possible pull out under load conditions before the concrete is poured.

The concrete shall be reinforced with two layers of A393 mesh top and bottom with 40mm cover of concrete.

Concrete shall be grade C40/50 to a depth of 300mm.

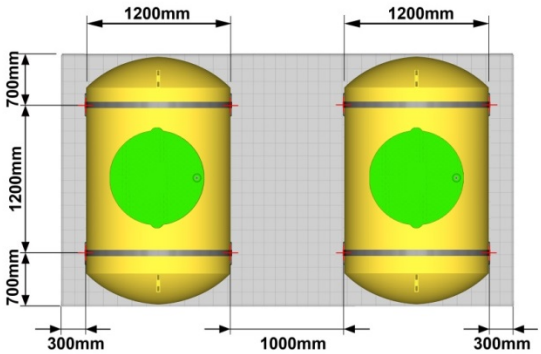
Drawings shown are not to scale.



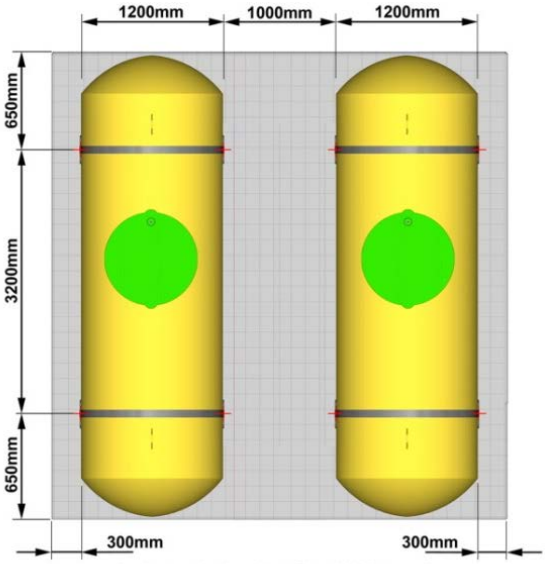
Dimensions for customer cast bases

Base dimensions for **2100 litre** below ground tanks				
Tank Configuration	No. of tanks	A	B	C
Side by Side	2	4000mm	2600mm	300mm
	3	6200mm		
End on End	2	1800mm	5986mm	

Base dimensions for **4000 litre** below ground tanks				
Tank Configuration	No. of tanks	A	B	C
Side by Side	2	4000mm	4500mm	300mm
	3	6200mm		
	4	8400mm		
	5	10600mm		
	6	12800mm		
End on End	2	1800mm	10000mm	
Two by Two	4	4000mm		
Three by Two	6	6200mm		



Anchor point locations for multiple Type 227 Underground 2100 litre tanks
(Dimensions to anchor point centres +)



Anchor point locations for 4000 litre tanks
(Dimensions to anchor point centres +)

Figure 4.17.12 – Anchor points

Below Ground Tanks

Installation Process

In order to permit safe entry of the excavation for the engineers to complete the installation of the regulator and service pipework, the excavation must be partly backfilled once the tank is in position and has been strapped down.

The excavation should be backfilled to a point halfway up the shell of the tank. The actual depth of the partly backfilled excavation will vary slightly depending on the size of the tank but should be between 900 and 1100mm as shown in Figure 4.17.13.

For semi-mounded installations, the point halfway up the tank may be at or above the surrounding ground level. In this case, the trench for the pipework should be brought up to the tank lid. A minimum depth of cover of 300mm must be achieved over the tank shell and 600mm over the pipework when the installation is finished.

To minimise the impact on the installation process there are three options available:

Option 1

Option 1 will require your contractor to backfill the excavation on the agreed installation date.

a) Arrange for the excavation, and where required concrete base, to be prepared in accordance with the above specification.
b) We will then deliver the tank(s) and arrange for our engineer to meet your contractor.
c) Once the tank(s) are in position, we will wait for up to two hours* while you contractor backfills the excavation to a safe level as shown in Figure 4.17.13.
d) The engineer will then complete the tank installation.
e) Your contractor can then finish the work to backfill the excavation.
f) Your installation is then ready to use and you can place your first order for LPG.

Option 2

Option 2 will mean your contractor will not need to be onsite on the agreed installation date but will need to make additional visits to complete the installation.

a) Arrange for the excavation, and where required concrete base, to be prepared in accordance with the above specification.
b) We will then deliver the tank(s) and put it in the correct position in the excavation.
c) You will arrange for the excavation to be backfilled to a safe level as shown in Figure 4.17.3 and advise us once this has been completed.
d) Our engineer will return to complete the installation.
e) You can then arrange for the remaining excavation to be backfilled. Your contractor can be onsite on the agreed installation date to do this or they can return at a later date.
f) Your installation is then ready to use and you can place your first order for LPG.

Option 3

Alternatively, if preferred, Calor can complete the entire installation, including the excavation work for the tanks.

*If we are required to wait longer than two hours then an additional charge will be applied. You should ask your contractor how long they will need to complete the part backfill.

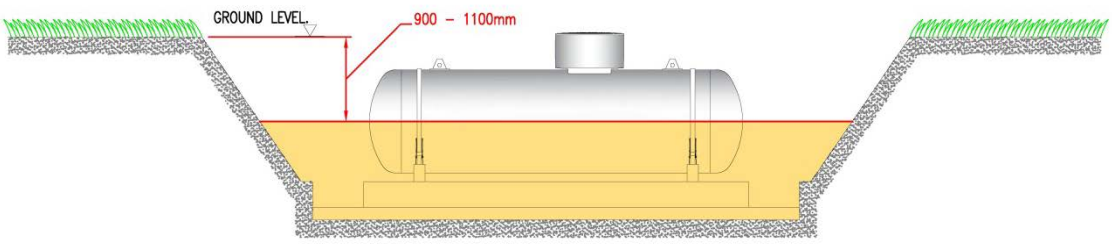


Figure 4.17.13 – Below ground tank excavation part backfill requirements

End of section 4.17 – Below Ground Tanks – Installation